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ELEVENTH ANNUAL REPORT.

TO THE RIGHT HONOURABLE

SIR GEORGE O. TREVELYAN, BART.,

Her Majesty's Secretary for Scotland.

OFFICE OF THE FISHERY BOARD
FOR SCOTLAND,
EDINBURGH, 1*st June* 1893.

SIR,

In continuation of our Eleventh Annual Report, we have the honour to submit—

PART III—SCIENTIFIC INVESTIGATIONS.

GENERAL STATEMENT.

This part of the Eleventh Annual Report deals with the Scientific Investigations carried on by the Board in 1892, in connection with the sea and other fisheries. An account is also given of the scientific fishery work, and the fishery regulations in other countries possessing sea fisheries, and of the principal means being taken to protect and develop them.

The scientific work has been carried out and the scientific report prepared under the supervision of Dr T. Wemyss Fulton, F.R.S.E., the Superintendent of Scientific Investigations.

In the course of 1892 the various investigations were prosecuted on the same lines as in previous years, and have resulted in further extensions of knowledge of the life-histories and habits of the food fishes, so far as these relate to fishery questions. A large part of the inquiries, both biological and physical, have been made by means of the 'Garland,' the small steam-vessel belonging to the Board; but, as has been frequently pointed out, the small size and unseaworthiness of this vessel have considerably curtailed the extent and usefulness of the investigations. The 'Garland,' which was bought by the Board in 1886, was originally a pleasure yacht. Its registered tonnage is only 36·4 tons, its length 84 feet 7 inches between perpendiculars, its breadth 15 feet, and depth 8 feet 5 inches. Although improvements have been made in her from time to time, including the renewal of the boilers and propeller, the utmost speed she can attain is between eight and nine knots an hour, while an ordinary steam-trawler goes from ten to twelve knots.

As a consequence of the inability of the 'Garland' to face anything but moderate weather, or venture far from land, the work has been practically restricted to the territorial waters, and the firths and bays. It has not been possible to extend the investigations, which have already yielded such valuable results in the inshore waters, to the breeding-grounds situated at some distance from the shore, which constitute the great source of supply to the territorial seas; nor to the offshore fishing-grounds where both liners and trawlers chiefly work, and where the great bulk of the fish are caught. Were the 'Garland' replaced by an efficient sea-going vessel of the type of a good beam-trawler, capable of visiting the fishing-grounds in weather when an ordinary trawler or fishing boat can easily carry on its work, the Board would be able to push on these investigations, and at the same time to prevent, in a manner much more satisfactory than is possible under present circumstances, the depredations of trawlers in the waters closed against this mode of fishing.

It may be stated that the Sea Fisheries Committee of Lancashire have during the present year acquired a steam-vessel, much superior to the 'Garland,' to be employed exclusively in the fisheries work of the Lancashire district; that the United States Fish Commission have two large ocean-going steamers and a schooner for scientific work alone; and that in Canada the Government—which provides about £90,000 annually for the supervision and promotion of the fisheries—possesses eight steamers and two sailing-vessels in connection therewith.

Part of the scientific work was also carried on at the marine laboratories at St Andrews and Dunbar. At the latter the researches upon the development of the plaice and the rate of growth of fishes were continued, and at the former a number of investigations were made on the eggs, larvæ, and development of a number of the food fishes, on the rate of growth of fishes, and on the distribution of pelagic fish eggs and young fishes. These are referred to more fully below.

Physical observations have been made daily at ten fixed stations —five on the East Coast and five on the West Coast—and also on board the 'Garland,' the 'Vigilant,' and H.M.S. 'Jackal.' Besides these, the Board have arranged for a physical investigation, during the present summer, of the waters around the Shetland and Orkney Isles, and extending from the Moray Firth to the Hebrides, according to a scheme drawn up by Dr H. R. Mill, of the Royal Geographical Society; and they have also agreed, at the request of the Swedish and Danish Governments, to make a series of similar observations on the North Sea plateau to the east of the Shetlands, in conjunction with the hydrographic survey being made in the Kattegat, Skagerack, and Baltic, by the Danish and Swedish Governments, under the supervision of Professor Otto Pettersson, of the Stockholm University.

THE INFLUENCE OF BEAM-TRAWLING.

The Trawling Experiments of the 'Garland.'

The results of the experiments and observations of the 'Garland' into the relative abundance of the food fishes in the territorial waters where beam-trawling is prohibited, and on the influence of this prohibition on the fish supply, are given in a special report in Section A.

In the course of the year the various trawling stations in the Firth of Forth, St Andrews Bay, Montrose Bay, Aberdeen Bay, and the Moray Firth were examined, the stations being tested on 158 occasions, as compared with 156 in the previous year. Owing to the closure of the whole of the Moray Firth to trawling in November last (*vide* Part I. of this Report, p. xlix.), a number of additional stations for scientific investigations were selected in that important fishing area. Six of these are on, or in the neighbourhood of, Smith Bank, the well-known spawning-ground for plaice, cod, haddock, &c. For the reason previously adverted to —the small size of the vessel—the Board did not deem it advisable to incur the risk of sending the 'Garland' to the Moray Firth during the winter months or in early spring, and it was therefore impossible to examine Smith Bank and other offshore grounds at the most important time, namely, the spawning period.

As the closure of the Moray Firth involves, for the first time in the history of fishery regulation, the protection of spawning-grounds for white-fish in offshore waters, it is of great importance that the Board should be placed in a position to ascertain the results of this protective interference, and the extent to which such measures are likely to be beneficial to the fish supply.

In the area of the Firth of Forth and St Andrews Bay, where the trawling investigations were conducted with most regularity, the stations were examined on 139 occasions. In the Firth of Forth, where 99 hauls were made, it was found that a slight decrease had occurred in the general abundance of fish in the protected waters, as compared with the previous year. The falling off was more marked in flat-fish than in round-fish, the greatest decrease being in plaice, which fell from an average of 43·5 per haul of the net in 1891 to an average of 36·4 in 1892. There was a decrease in cod and whitings, and an increase in haddocks and gurnard.

In the St Andrews Bay area the result of the examination of the various stations also showed that a decrease had taken place in the general abundance of the food fishes in the closed waters. Flat-fish fell from an average of 109·4 per haul of the net in 1891 to 84·0 in 1892. The decrease in common dabs was noteworthy. The catch of cod and whitings was greater than in the previous year.

At the stations in the open waters of the Firth of Forth and St Andrews Bay there was also a great falling off in the numbers of flat-fish and a slight increase in the numbers of round-fish captured.

The trawling experiments in St Andrews Bay and the Firth of Forth have now been carried on for seven years—ever since beam-trawling was prohibited in these waters—and the results of the investigations made in 1892 tend to confirm the conclusions stated in last year's Report. The quantities of fishes captured have varied within certain limits from year to year; but an analysis of the records for the period mentioned brings out the fact very clearly that the abundance of the food fishes has on the whole diminished since the waters were closed to beam-trawling. Taking the two areas—the Firth of Forth and St Andrews Bay—together, the average catches of flat-fish and round-fish per haul of the net in the protected waters in each year are as follows:—

	Flat-fish.	Round-fish.	Total.
1886,	131·1	79·6	213·9
1887,	270·6	115·9	390·1
1888,	163·9	80·5	248·7
1889,	148·2	34·5	187·1
1890,	201·9	80·9	288·0
1891,	112·2	43·7	161·6
1892,	95·1	53·9	156·4

These figures indicate the fluctuations referred to above, but they also indicate a steady falling off in the quantity of fish caught. In order that comparison may be made between the results of the first few years following the prohibition of trawling and those obtained in the last few years, they have been reduced to averages as follows:—

	Flat-fish.	Round-fish.	Total.
1886–1888,	188·6	92·0	284·2
1890–1892,	136·4	59·5	201·6

More detailed examination of the trawling records shows that in the two triennial periods, the annual mean number of plaice captured per 'shot' of the net in the closed waters has fallen from 90·4 in the period 1886–1888 to 70·4 in the period 1890–1892, or a decrease of 20. Lemon soles have decreased from 15·2 to 6·3 in the same years; and dabs from 80·8 to 57·4. Among round-fishes, cod and whitings have increased, and haddocks and gurnards diminished. The averages referring to the open areas bring out similar results, with the difference that dabs have increased and flounders slightly decreased in numbers.

As has been said, a certain and indefinite amount of natural fluctuation, due to variations in the condition of the weather, &c., must be taken into account in considering these trawling statistics. But it is improbable that this is the principal explanation of the gradual and considerable decline in the abundance of the food fishes which the figures disclose. And it must be borne in mind that these figures refer to nearly 150,000 fishes, captured in about 700 hauls of the net on the same grounds. It would rather appear that the collective results of the 'Garland's' observations point to general over-fishing, especially as was indicated in last year's report, in the extra-territorial waters where the food fishes mostly spawn; and thus the normal supply of floating fish-eggs and larval fishes does not reach the inshore grounds. It is a noteworthy circumstance that although the prohibition of beam-trawling in territorial waters must have served to protect immature plaice more than the young of other fishes (owing to their very special distribution), this fish is diminishing in abundance year by year.

Special Fishery Statistics.

In considering the influence of beam-trawling on the fish supply, it is desirable to bring into comparison with the results of the trawling experiments certain statistics relating to the productiveness of the territorial waters and the quantities of round-fish and flat-fish captured by line and trawl in the districts where the trawling experiments are carried on. These will be found in the special report referred to. The districts from which such detailed statistics have been obtained comprise that part of the coast extending between Dunbar on the south and Aberdeen on the north, including both these places. On this portion of the coast the quantity of fish landed by line-fishermen and beam-trawlers in 1892 amounted to 804,451 cwts., as compared with 759,440 cwts. in 1891, or an increase of 45,000 cwts. This increase was entirely due to beam-trawling. Beam-trawlers landed 56,645 cwts. more fish in this area last year than they did in the previous year, while line fishermen landed less by 11,634 cwts. Of the total quantity, 698,281 cwts. were round-fish and 106,170 were flat-fish; an increase over the quantities landed in 1891 of 40,776 cwts. of round-fish, and 4235 cwts. of flat-fish. The increase in flat-fish is entirely due to an increased quantity of skates and halibut caught by line-fishermen. Beam-trawlers landed 61,937 cwts. more round-fish and 5292 cwts. less flat-fish than they did in the previous year, that is to say, an increase of 25·8 per cent. in the catch of round-fish, and a decrease of 6·9 per cent. in the catch of flat-fish.

The statistics of the quantities of fish caught by line-fishermen in the territorial waters of the East Coast, from North Berwick on the south to Skateraw, a few miles south of Aberdeen, on the north, have also been tabulated for comparison with previous years, and the monthly and yearly averages per ‘shot’ of the line given. The figures show that in the territorial waters referred to there was a decrease last year in the number of ‘shots,’ or visits to the fishing grounds—from 37,928 in 1891 to 32,543 in 1892. There was also a decline in the quantity of fish caught, both absolutely and in proportion to the number of shots, the average per ‘shot’ for the year being 1·94 cwt. as compared with 3·43 in 1891. The statistics indicating the number of ‘shots’ in the territorial waters, the quantity of line-caught fish obtained, and the average quantity per ‘shot,’ for the last five years are as follows :—

Years.	Total Trips or Shots.	Quantity of Line-caught Fish. cwts.	Average Quantity per Shot. cwts.
1888,	43,077	109,396	2·539
1889,	42,898	107,029	2·494
1890,	34,501	83,692	2·425
1891,	37,928	92,469	2·438
1892,	32,543	63,420	1·94

The falling off in the quantity of fish caught in the territorial waters was common to all kinds, the decrease in haddocks and whitings being specially noticeable. All along the coast a marked feature in the fishing has been the diminished takes of whitings.

OVER-FISHING OF THE SEA, AND ITS REMEDIES.

The falling off in the relative abundance of certain of the food fishes, especially in the waters near the shore, when compared with the increase in the means of capture, is not confined to the East Coast of Scotland. In England, Norway, Denmark, Belgium, Holland, France, Spain, Canada, Newfoundland—indeed, wherever sea fisheries are prosecuted on a large scale—similar complaints are made; and in many of these countries remedial measures, by stringent regulations and the artificial propagation of the more valuable of the food fishes, have been carried into effect. It has now been made clear by statistical and scientific investigations that the seas around our coasts are not the inexhaustible storehouses of food material that they were thought to be less than a generation ago. The doctrine that the operations of man cannot disturb the balance of life in the sea, and diminish or exhaust the supply of valuable food fishes, is now abandoned by fishery authorities almost everywhere. During the past generation an immense increase has taken place in the extent and efficiency of the machinery of capture, and the introduction of steam-power has revolutionised the industry. The statistics collected by the Board show that, while forty-five years ago the average equipment in fishing material of each Scottish fisherman was 1306 square yards of netting and 142 fathoms of line, it is now 3917 square yards of netting and 724 fathoms of line. Owing to the depletion of inshore waters, fishermen are compelled nowadays to go further and further to sea in the search for more productive grounds, and for many years they have ranged the northern parts of the North Sea, frequently fishing within sight of the Norwegian coast. Larger and better boats, a much greater quantity of fishing material, and a more extensive area of fishing-grounds seem to be necessary in order to keep up the supply of fish.

It has been shown that flat-fish, particularly the large valuable kinds, such as soles, turbot, and plaice, are more susceptible of diminution in numbers than round-fish. Notwithstanding a great increase in the number and efficiency of beam-trawlers, the quantity of these fish captured is decreasing yearly. The chief scientific reasons which serve to explain this circumstance are, that most flat-fishes exist in much less numbers than round-fishes, the extent of their migrations is more restricted, and their rate of growth and attainment of sexual maturity slower. Hence the reproductive capacity of the species within a given area and period is relatively small, and the destructive operations of man may bear a large ratio to the normal destruction from natural causes. By the experiments on the migration of fishes, described in the present report, it is shown that a large percentage of the fish on a particular ground may be captured by fishing operations—that the annual harvest of a given area bears a much larger proportion to the stock than has been commonly supposed. Of the plaice marked and liberated, nearly ten per cent. were recovered almost exclusively by hook and line, and there is reason to believe that the number actually recaptured by trawl and line combined was very much greater. Thus, in the case at least of this important flat-fish, the ratio of man's destructive influence may be very considerable when compared with the destruction from natural causes.

In almost every maritime country sea fisheries are now subjected to protective regulation, by the prohibition, for a shorter or longer period, of certain methods of fishing, or of all methods, within defined areas, by interference with the apparatus of capture, the prohibition of catching or landing certain fish, &c. In Scotland, by the operation of the Herring Fisheries (Scotland) Act of 1889, and by the bye-laws passed by the Board in conformity with that Act, the whole of the territorial waters, and certain firths and bays, have been closed to beam-trawling. It is felt, however, that the powers of the Board are not at present sufficient to enable them to regulate the sea fisheries to the best advantage. They have no power of interference with the apparatus of capture, similar to that exercised by other fishery departments in Europe, and which was conferred upon the English Sea Fisheries District Committees by the Sea Fisheries Regulation Act of 1888. It is also becoming more evident, from the results of scientific fishery investigations both in this country and abroad, that the present limit of the territorial waters to three miles from low-water mark is inadequate for the proper regulation of the fisheries. When the three-mile limit was established for the North Sea by international agreement, early in the present century, it was assumed that the breeding-grounds of the food-fishes were situated within that boundary; but it has now been proved that this is very rarely the case, and that the great majority spawn outside the territorial waters. If jurisdiction were extended to ten or twelve miles from the shore it would enable these to be brought under more effective control, either by the protection of defined areas during the spawning period or otherwise.

THE HATCHING OF SEA FISH.

One of the measures which have been adopted in several countries to meet the depletion of inshore fisheries, consists in the restocking of the exhausted grounds with multitudes of fry, hatched in sea-fish hatcheries. Such hatcheries now exist in the United States, Canada, Norway, and Newfoundland; they are proposed in Belgium and France; and the Lancashire Sea Fisheries District Committee have resolved to establish one at Port Erin, in the Isle of Man. During last season, 240,000,000 cod were hatched at the Norwegian establishment at Arendal, and placed on the fishing-grounds—the total cost being about one penny for each ten thousand fry hatched and 'planted.' In Newfoundland the number of cod hatched and distributed was 165,250,000, and the number of lobsters 429,785,000; while 7,000,000 lobsters were hatched in the Canadian establishment.

As stated in last year's Report, the Board, after careful consideration of the question, resolved that this method of increasing the fish-supply should be extended to Scotland; and with this object in view, a sea-fish hatchery was erected at Dunbar, the whole of the expenditure being met from the ordinary votes for scientific investigations. The hatching-house consists of a substantial double-walled wooden building, 35 feet long by 25 feet broad, with interior space for sixteen hatching-boxes, which can accommodate at one time 80,000,000 eggs. The concrete spawning-pond, in which the ripe fish are placed at the spawning time, has a capacity of 60,750 gallons, and the pumping apparatus consists of two Worthington direct-acting steam-pumps, each capable of throwing over 3000 gallons of sea-water per hour, and which are supplied by an 8-horse-power locomotive steel boiler. The water is pumped from the mouth of the harbour, where it is singularly pure.

As has been pointed out in previous reports, an indispensable condition for the successful hatching of sea fish is the possession of tidal creeks or enclosures adjacent to the hatching-buildings, in which the 'spawners' may be collected and kept, and the fry reared to a certain size. Such creeks exist at Dunbar, and have been, with part of the ground adjacent, placed at the disposal of the Board for the purpose, by the War Office and the Magistrates and Council of the burgh. Messrs Strain, Robertson, and Thomson, C.E., who have surveyed the creeks, and drawn up plans for their enclosure, report as follows:—

> 'We have examined and surveyed the natural sea-creeks at 'Dunbar in connection with the hatchery and tank at present 'in course of construction there, and beg to report that, if 'these creeks were enclosed by concrete walls as proposed, 'and for which we prepared plans, the total superficial area 'within those walls would be 13,545 square feet at high-water 'of ordinary spring tides.
>
> 'The area of the West creek is about 5,800 square feet, 'and that of the East creek about 7,655 square feet.
>
> 'When filled by ordinary spring tides, these creeks would 'contain about 560,000 gallons of water at high-water, and 'would have a maximum depth of 14 feet in the West creek, 'and 16 feet in the East creek.'

It has been found impossible to undertake the closure of these creeks from the ordinary vote for scientific investigations—which was insufficient to complete the fitting up of the hatchery before last spawning season—and renewed application was made to the Government for a comparatively small sum of money (£1500) for this purpose. This application was strongly supported by the Secretary for Scotland, but the Lords of the Treasury again declined to sanction its appearance on the Estimates to be submitted to Parliament for the current financial year; and the Board have to express their regret that they have in consequence been unable to proceed with this work.

It may be pointed out that both scientific fishery authorities and those engaged in the practical part of the industry are agreed as to the necessity of establishing sea-fish hatcheries for the benefit of inshore fisheries, as is apparent from the resolutions passed at various meetings of fishermen, fish-trade associations, and fishery conferences, as well as by the evidence recently led before the Select Committee of the House of Commons. The Board, therefore, again express the hope that the small sum named will be speedily placed at their disposal, and thus enable them to proceed on a large scale with the hatching and rearing of the food fishes.

SEINE-NET FISHING FOR HERRINGS AT BALLANTRAE BANK.

Complaints having been made by the fishermen of Ballantrae, Girvan, and other places on the coast of Ayrshire, that the use of the seine-net was injurious to the spring herring fishery at Ballantrae Bank and off the Ayrshire coast, an inquiry was held on the subject, at Girvan, in January last, by the Chairman, accompanied by Dr Fulton. As a consequence, it was decided by the Board to make a careful examination into the use and action of this net at Ballantrae Bank, with especial reference to the injury it was alleged to do to the herring-spawn and in capturing great numbers of immature fish. The season that followed was unfortunately stormy and very few fish were caught, so that it was not possible to carry on the investigations which the Board desired. An inquiry is, however, being made as to the action of the seine-net in capturing immature herrings at other parts of the Clyde, and it is hoped that it will be possible to complete these investigations during the next spawning season at Ballantrae Bank.

WEST COAST EXPEDITION OF THE 'GARLAND.'

During the month of August, and part of July, the 'Garland' was engaged on the West Coast, under the direction of Mr W. Anderson Smith, a member of the Board, in investigating the condition of a number of the sea-lochs north of Oban, and a report on the results will be found in the present Report. Bad weather interfered to some extent with the operations; but the observations made showed that, with few exceptions, the fish fauna of most of the lochs examined was poor. The main result of the trawling operations proved that no important trawling operations of a mercantile character could ever be carried on in those confined waters. Neither the character of the bottom nor the character of the fish obtained was such as to induce trawling vessels to risk their trawls for any possible returns. The fish were, as a rule, of an inferior class, as well as in comparatively inferior condition, and it was found impossible to trawl for any length of time owing to the rough nature of the bottom. In the Hebridean lochs and the waters bordering thereon, the fish, as well as the entomostracan fauna, were more numerous and of superior character. Bad weather prevented an investigation being made of the great fishing-banks to the south of Barra Head. In the Report on the Expedition, Mr Smith mentions the rarer organisms obtained by the trawl, dredge, &c.; and a list of the mollusca obtained is given by Mr Alfred Brown.

THE MIGRATIONS AND RATE OF GROWTH OF THE FOOD FISHES.

For a few years experiments have been made on the migrations of the food fishes, and in the present Report Dr T. Wemyss Fulton describes the results of these. Between 3000 and 4000 fishes, belonging to 22 species, were marked and set free in the sea, most of them being liberated in the Firth of Forth and St Andrews Bay. Of 1250 plaice thus dealt with, 103, or 8·2 per cent., were recovered; but the percentage rises to 9·9 when the initial experiments under a faulty system are disregarded. The period which elapsed between liberation and recapture varied from two days to 819 days (or two years and three months), the average being 239·6 days; but the extent of the movement does not correspond to the time the fish was free in the water. The number of miles between the points of liberation and recapture varied from practically *nil* to twenty-eight, the average being 6·15 miles. The experiments bring out a point of considerable interest in regard to the habits of this important flat-fish. It appears that within the Firth of Forth and St Andrews Bay they move in a definite direction. In the Firth of Forth immature plaice circulate, as it were, along the south shore westwards, and along the north shore outwards or eastwards, some of them passing round Fife Ness into St Andrews Bay. In St Andrews Bay this movement is continued with even more distinctness northwards to the mouth of the Tay, some of the marked fish passing across the mouth to Carnoustie Bay. These experiments concerning the migratory movements of the plaice show (1) that plaice tend to remain within the inshore waters during the period of immaturity; (2) that while they may travel 20 miles in about a year or so, their movement is, as a rule, slow; (3) that in the areas investigated, their movement is in a definite direction. The results are in agreement with other investigations of the 'Garland,' and help to complete our knowledge of the cycle of life and movement of this important flat-fish. The number of common dabs marked and liberated was 337, of which eleven, or 3·2 per cent., were recovered. The distance travelled varied from 3 to 37 miles, the average distance being 14·5 miles, and the mean period of freedom being 178·3 days. The experiments show that this flat-fish is much more active than the plaice, that it moves considerable distances in comparatively short periods, and indifferently in any direction, inshore or offshore, or along the coast. Of 196 codlings dealt with, ten, or 5·1 per cent., were recovered. The mean period of freedom was 74·7 days, and the distance travelled varied from 1 to 52 miles. One travelled 22 miles in 27 days, and another 52 miles in 69 days, from the Firth of Forth to Dunottar Castle, Kincardineshire. The results show that codling may remain for considerable periods at about the same place in the territorial waters, or travel long distances with considerable speed, and that there is no regularity in the direction, as in the case of the plaice. Particulars in regard to other marked and recaptured fish are given, and also the information obtained from the experiments as to the rate of growth of food fishes.

The important subject of the rate of growth of fishes is also dealt with by Mr Charles Williamson, M.A., B.Sc., the Fisheries (Woodall) Prizeman of St Andrews University, the investigation having been made by the aid of specimens preserved at the Marine Laboratory and the University Museum, St Andrews. Large numbers of fish of different sizes have been measured, and their age, and therefore their rate of growth, calculated from what we know of their spawning period. Mr Williamson gives particulars regarding the common dab, gurnard, ling, wolf-fish, and lemon dab, and discusses the results of similar investigations made by Mr J. T. Cunningham at the Laboratory of the Marine Biological Association.

THE PELAGIC FAUNA AND FOOD OF FISHES.

In the present Report several papers will be found dealing with the distribution and nature of the pelagic fauna and food of fishes.

'*The Pelagic Fauna of St Andrews Bay.*'—Professor M'Intosh, F.R.S., describes his investigations, extending over several years, on the distribution of the pelagic fauna.

In the spring of 1889 myriads of larval and post-larval herrings filled St Andrews Bay, coming probably from the mouth of the Firth of Forth, as it is many years since herring eggs were discovered at the once famous spawning-ground at the Old Hake, where Lord Playfair and Professor Allman carefully investigated them. The young of certain fishes not usually encountered in the pelagic fauna occur at certain definite seasons, as pipe-fish and eels, and if the weather in the early part of May be warm, young Pleuronectids—such as plaice, flounders, and dabs—come in great numbers to the surface of the water. Professor M'Intosh refers to the pigmentation which exists in the embryos in pelagic eggs of almost all species of food fishes, as being an important factor in leading to their destruction by fishes, and mentions the case of a herring which was found to contain thirty such eggs, belonging to different species. He also describes the occurrence of various species of molluscs, annelids, and crustacea in different seasons. The paper is accompanied by a large number of tables which show the distribution of the fauna at the various stations in the different months of the year.

Additions to the Fauna of the Firth of Forth.—In connection with the inquiries on the distribution of the organisms which form the food of fishes, Mr Thomas Scott, F.L.S., has for a series of years carried on special investigations into the fauna of the Firth of Forth, and in the present Report gives his fifth contribution to the subject. Before these investigations were begun by Mr Scott, the number of species of crustacea which had been found in the Firth of Forth was only about 120, while now upwards of 400 have been described. In the present paper 26 species of crustacea are described, 8 of these being new to science, and most of the others not formerly discovered in the district. Mr Scott's paper is illustrated by four plates from the hand of his son, Mr Andrew Scott.

The Invertebrate Fauna of Inland Waters.—In continuation of his previous researches on the nature and distribution of the crustacean and other fauna of inland waters, Mr Scott last year investigated Loch Morar in Argyleshire, the results being contained in a paper in the present Report. Loch Morar is a very deep fresh-water loch, the deepest sounding taken by Mr Scott being 170 fathoms, or 1020 feet, and no living organism could be detected in the mud brought up from this depth. Entomostraca were abundant at and near the surface, but much fewer at 50 and 100 fathoms; two or three species of pelagic Copepoda and five of Cladocera were obtained, and from the bottom gatherings eight species of Copepoda, five of Ostracoda, and sixteen of Cladocera. A new Copepod was obtained, forming a new genus, *Moraria.*

THE LIFE-HISTORIES AND DEVELOPMENT OF THE FOOD AND OTHER FISHES.

In the present Report, Professor M'Intosh contributes a valuable paper on the eggs, young, and development of a number of the food fishes, the work having been carried on, as in previous years, at the Marine Laboratory, St Andrews. The eggs and larvæ, which have, for the first time in this country, been fully described and figured at St Andrews Marine Laboratory, include the cod, haddock, whiting, gurnard, ling, torsk, long rough dab, turbot, brill, plaice, lemon dab, flounder, common dab, sole, sail-fluke, dab, sprat, frog-fish, halibut, sand-eel, &c.

In the present paper Professor M'Intosh describes and figures the eggs and larvæ of the poor-cod, the eggs and embryo of the saithe or green-cod, the eggs of the halibut, &c., and also deals with the special characteristics of certain young pleuronectids, including the turbot, brill, and topknot, the spawning period of the pollack, and certain pelagic eggs and young fishes which have not been hitherto identified. Ripe eggs of the poor-cod were artifically fertilised in June last year, and also obtained in the tow-nets in the open sea, and the young fish were successfully hatched from them, the larvæ somewhat resembling those of the whiting on emergence. The eggs of the saithe and halibut have also been studied and described. The paper is illustrated by five plates.

In the present Report will be found the second part of Dr J. H. Fullarton's paper on the development of the plaice, the preliminary part having been published in the *Ninth Annual Report.* In this paper Dr Fullarton gives some of the results of his investigation into the origin of the liver, heart, and renal organs and the changes that take place in these before the absorption of the whole of the yolk. The paper is illustrated by four plates.

In the present Report will also be found a list of the pelagic eggs, larval and young fishes procured by the 'Garland,' the identification having been undertaken by Mr A. J. Masterman, B.A., at St Andrews Marine Laboratory under the supervision of

Professor M'Intosh, who has also identified the young fishes procured. Mr Masterman, in his paper dealing with this subject, describes their distribution in the Firth of Forth and St Andrews Bay. At the inner group of stations in the Firth of Forth—that is to say, to the inside of a line between Fiddra and Elie Ness—pelagic eggs seem to be usually abundant, and the bottom abounds with all the common forms of larval, post-larval, and young fishes. The eggs first appear in February, those of the plaice and long rough dab being in great abundance, succeeded towards the end of the month by the haddock and cod. During March and the first half of April the eggs of the haddock predominate, the majority appearing to hatch about the middle of the latter month.

Cod are rather later, but fairly plentiful, as also are plaice. Towards the end of April the eggs of the common dab become abundant, and those of the gurnard and sprat make their first appearance. About the same time the eggs of whiting, bib, flounder, and poor-cod are found in small numbers. In May the larval and post-larval forms, with young fishes, are abundant, and the dominant forms of eggs are those of the gurnard, sprat, and rockling, among rarer forms being the lemon sole, brill, and dragonet. The predominance of sprat, gurnard, and rockling is continued steadily throughout June, and in this month the eggs of turbot and ling are met with, though in limited numbers. In July the number of floating eggs undergoes a distinct diminution, the sprat, gurnard, and rockling being all at the stage of hatching, and turbot and lemon sole are still encountered. In August the ova are still less in number, but the young fishes at the bottom become very plentiful, especially gobies, herrings, and sprats. In October young clupeoids swarm, together with pleuronectids, gobies, and dragonets, and in December they are sparse. At the middle group of stations, within the Isle of May, the general features of the distribution of the floating fish-eggs seem to resemble those of the first group, but those of the long rough dab occur later. In May the eggs of the whiting and poor-cod seem most abundant, taking the place of the immense quantities of sprat eggs at the inner stations. Abundance of young clupeoids and sand-eels occur all over this area, and in August there are great quantities of post-larval flat-fishes. At the stations beyond the Isle of May enormous quantities of haddock eggs were obtained in March and early April, with those of plaice and long rough dab in abundance, and lesser quantities of cod and a few whiting.

Comparing the three groups of stations referred to, Mr Masterman points out that, as a general rule, the eggs of gadoids and flat-fish, such as cod, haddock, plaice, and long rough dab, are most numerous at the seaward stations, beyond the Isle of May; in the intermediate group, the eggs of the lesser gadoids, such as whiting and poor-cod, are more abundant, and the eggs of the sprat and gurnard seem to be most frequent at the inner group of stations. As regards development, it appears to be a somewhat general rule that the eggs at the inner stations are at a slightly later stage than those further down the estuary.

THE DISEASES OF FISHES.

In the present Report will be found several short papers by Mr George Sandeman, descriptive of various morbid growths which have been found in different fishes. The pathology of fishes is but little known; but investigations on this subject have been recently made in America. Mr Sandeman describes multiple tumours in plaice and flounders, which seem to be obscure in origin, a tumour from a tunny captured in the Forth, and others.

PHYSICAL INVESTIGATIONS.

In the present Report will be found an elaborate paper, accompanied by numerous tables and a chart, by Dr H. R. Mill, F.R.S.E., F.R.S.G.S., and Mr Andrew Herbertson, on the physical observations made at the various fixed stations on the East and West coast, on the 'Garland,' and on the 'Vigilant' and 'Jackal.' The mean temperature of the sea around the coasts of Scotland in 1892 was considerably lower than in the previous year, being from one degree to a degree and a half lower on the East coast, and from half a degree to one degree lower on the West coast it was also lower in 1891 than in 1890. For instance, the mean annual temperature of the sea at the Bell Rock Lighthouse was 9·2° C. in 1890, 8·7° C. in 1891, and 7·8° C. in 1892. At stations where temperatures of surface and bottom are noted, it is found that the upper layers of water are warmer during the early months of the year, and the lower layers are warmer in autumn. The observations on the density of the sea at the various stations are very fully discussed, as are also those made on board the 'Garland,' especially with reference to the transparency of the water at different seasons of the year. The observations made during the years 1887–1892, on board the 'Vigilant' and H.M.S. 'Jackal,' so far as they are of value, are tabulated for the first time.

CONTEMPORARY FISHERY WORK.

An account is given in Section D, by Dr T. Wemyss Fulton, of the contemporary fishery work in this country and in a number of foreign States. From this review it appears that there is in almost all countries where the sea fisheries are largely prosecuted, complaints as to the falling off in the abundance of many of the food fishes, especially in the waters around the coasts, and various regulative measures have been adopted and enforced in different countries with a view to their preservation. In no country is free and unrestricted fishing now permitted, and in some cases, as in Denmark, the regulations are minute, and affect both the places and times for fishing and the apparatus of capture. Sea-fish hatching has also been prosecuted on a large scale in Norway, Newfoundland, the United States and Canada; and very great activity is being shown to extend protect, and develop the various sea fisheries. An instance may be found in Japan, where the Government have recently issued an elaborate report in four volumes, embodying the results of a survey of the fisheries of that country.

The Board is indebted to a large number of foreign fishery authorities and others for co-operation in their scientific work. Among these may be mentioned: Dr P. P. C. Hoek, the Scientific Superintendent of Dutch Fisheries; Professor Pouchet, the Director of the Concarneau Laboratory; Professor Marion, the Director of the Marine Laboratory at Marseilles; M. Raveret-Wattel, Secretary to the Société Nationale d'Acclimatation de France; Captain Dannevig, the Superintendent of the Sea-Fish Hatchery at Flödevig, Norway; Captain Drechsel, Superintendent of Danish Fisheries, and the Naturalist, Dr C. G. J. Petersen; Señor Rafael Gutierren Vela, of the Spanish Fisheries Department; Professor Giglioli, Fishery Commissioner, Florence; Dr A. M. Malm and Dr Rudolf Lundberg, the Inspectors of Swedish Fisheries; Mr Adolf Nielsen, the Superintendent of the Newfoundland Fisheries, and the Rev. Mr Harvey, the Chairman of the Fishery Commission; Kloster-Kammer-director Herwig, the President of the Deutscher Fischerei Verein; Dr Heincke, the Director of the Biological Institute, Heligoland; Dr Ehrenbaum of Carolininsiel; The Prince of Monaco; Baron Jules de Guerne; and Mr Lindsay Thompson, the Chief Inspector of Fisheries, New South Wales.

We have the honour to be,

Sir,

Your most obedient Servants,

P. ESSLEMONT, *Chairman.*
JOHN GUTHRIE SMITH, *Deputy-Chairman.*
GEORGE H. M. THOMS.
D. M'KECHNIE.
W. C. M'INTOSH.
W. ANDERSON SMITH.
JAMES JOHNSTON.
WILLIAM BOYD.
J. RITCHIE WELCH.

SECTION A.—GENERAL REPORTS.

I.—REPORT ON THE TRAWLING EXPERIMENTS OF THE 'GARLAND,' AND ON THE STATISTICS OF THE EAST COAST FISHERIES RELATING THERETO. Part VII (Plate I.)

I. INTRODUCTORY.

During last year the trawling experiments of the 'Garland' were carried on at the various stations on the East Coast of Scotland, as in former years. The stations in the Firth of Forth and St Andrews Bay were examined once a month, so far as weather permitted, and those in the Moray Firth and off the Coasts of Forfarshire and Aberdeenshire less frequently. The number of ordinary trawlings or periodic examinations of the stations in the course of the year was 158, of which 99 were in the Firth of Forth area, and 40 in St Andrews Bay. The detailed results of these trawling observations will be found in the various tables annexed to this Report.

In addition to the systematic inquiry into the influence of beam-trawling on the abundance of the fish supply, the 'Garland' carried on throughout the year a series of observations on other important fishery questions. Special visits were made, when the weather was sufficiently favourable, to some of the fishing-grounds lying off the shore, and the investigations concerning the spawning and spawning-grounds of the food fishes, the nature and distribution of fish-food, the relative abundance and distribution of pelagic fish eggs, and young fishes, &c., continued. The study and description of the collections of pelagic eggs and larval and post-larval fishes have, as in previous years, been under the supervision of Professor M'Intosh, F.R.S., and the results are given in the present Report.

Continuous physical observations on the temperature and salinity of the sea have also been made at the various trawling stations and along selected lines in the Firth of Forth. These are dealt with in a special paper in the present Report.

During the month of August the 'Garland' was engaged in special trawling and dredging work on the West Coast north of Oban, as described in another paper.

Owing to the closure of the whole of the Moray Firth within a line from Rattray Point to Duncansbay Head to beam-trawling, which came into force on the 22nd November last, the 'Garland' was despatched thither for the purpose of making a careful examination of the present condition of the fishing-grounds, and selecting a number of experimental stations in the offshore waters. From the fact that the Moray Firth contains extensive spawning-grounds of white fish, the most important of which is the well-known Smith Bank, the experiment of closing it to beam-trawling will be watched with much interest.

The statistics in connection with the trawling experiments which have been collected as to the relative amounts of fish landed by line fishermen and beam-trawlers along the East Coast, the quantities obtained by line fishermen from the territorial waters, where trawling is prohibited, &c., are discussed below. A part of the work connected with the tabulation of some of these statistics has fallen upon the fishery officers of the districts concerned, namely, Mr John Murray, Newhaven; Mr Mair, Anstruther; Mr Duff, Montrose; Mr Bain, Stonehaven; and Mr Couper, Aberdeen. The trawling returns were kept by Mr Thomas Scott, F.L.S. I have also to acknowledge the assistance of Dr W. Ramsay Smith, B.Sc., in the tabulation of the statistics, and the care and zeal with which Captain R. Campbell, in command of the 'Garland,' has discharged his duties.

II. THE WORK OF THE 'GARLAND.'

1. The Firth of Forth.

Plate I.

The various trawling stations in the Firth of Forth area were examined last year once each month, with the exception of August, when the 'Garland' was engaged on the West Coast. The total number of ordinary trawlings at these stations was 99, of which 77 were made at the stations within the closed waters and 22 at the two stations outside. The tables giving these observations will be found at p. 41, and the analyses of the figures at p. 38. Dealing, first of all, with the stations in the closed area (I.–VII.), it will be found that a slight decrease occurred in the total abundance of fish as compared with 1891. In the latter year the average per 'shot,' or haul of the net, for all kinds of fish, was 189·4, while last year the average was only 184·4. In 1890 the corresponding average was 228·9. This decrease was due entirely to a falling off in flat-fish, which in 1891 yielded an average per 'shot' of 115·0, as compared with 106·3 last year. Round-fish increased slightly within the closed waters—namely, from an average of 67·7 in 1891 to 71·3 in 1892. At Stations VIII. and IX., situated beyond the territorial limit, and therefore where the prosecution of beam-trawling is not interfered with, there was a decrease in the average catch of flat-fish and an increase in that of round-fish. In 1891 the average for flat-fish was 50·8 per haul, compared with 43·0 last year; the averages for round-fish were 38·6 in 1891 and 73·0 in 1892. From these figures, therefore, it is evident that there was a falling off in the abundance of flat-fish last year both within and without the closed waters of the Firth of Forth area, and at the same time an increase in the numbers of round-fish, which was much greater at the stations in the open areas than within the Firth proper.

The figures representing the mean average catch of flat-fish and round-fish per 'shot' of the trawl at the seven stations within the closed area, and at the two stations in the open area, in each year since these experiments were begun, are given in the following tables :—

CLOSED AREA.

Year.	No. of Hauls.	Average Catch per Haul.		
		Flat Fish.	Round Fish.	All Fish.
1886	22	115·2	131·7	251·1
1887	28	200·6	144·4	351·5
1888	40	114·6	92·1	211·4
1889	70	109·1	49·8	164·8
1890	63	100·9	121·9	228·9
1891	84	115·0	67·7	189·4
1892	77	106·3	71·3	184·4

OPEN AREA.

Year.	No. of Hauls.	Average Catch per Haul.		
		Flat Fish.	Round Fish.	All Fish.
1886	5	44·0	36·4	85·4
1887	6	88·7	123·4	213·7
1888	10	32·6	114·7	151·2
1889	20	38·3	68·6	111·9
1890	16	53·7	184·7	241·6
1891	24	50·8	38·6	93·0
1892	22	43·0	73·0	119·4

Considering the relative abundance of the various kinds of fish within the closed area, the tables show that among flat-fish there was a decrease of all kinds, except long rough dabs. The greatest decrease was in plaice, the average in 1891 being 43·5, and last year 36·4. Among round-fish there was a decrease in cod and whitings, and an increase in haddocks and gurnards. At the stations in the open area there was a decrease in all kinds of flat-fish, except long rough dabs; there was, on the other hand, an increase in round-fish (cod, haddocks, and whitings), except in gurnards, which showed a considerable falling off.

2. St Andrews Bay.

During 1892 40 hauls of the trawl were made at the stations in St Andrews Bay—32 at those within the closed area and 8 outside. In the closed waters there was a slight decrease in the general average of fish captured per 'shot'—from 133·8 in 1891 to 128·4 in 1892. The falling off was entirely in flat-fish, the average catch of which was only 84·0 last year compared with 109·4 in the previous year. There was a considerable increase in the average for round-fish, namely, 36·6, as against 19·2 in 1891. At the station in the open area the results show a very marked falling off in the abundance of fish, the average per haul in 1891 being 300·1, while last year it was 105·7. This decrease took place entirely in flat-fish, the average catch of which last year was 50·3, as against

261·8 in the previous year. Round-fish, on the other hand, increased from an average per 'shot' of 30·8 in 1891 to 53·6 last year. The averages for each year since the trawling experiments were initiated are given in the following table:—

CLOSED AREA.

Year.	No. of Hauls.	Average Catch per Haul.		
		Flat Fish.	Round Fish.	All Fish.
1886	15	147·0	27·6	176·8
1887	16	340·7	87·5	428·8
1888	20	213·2	68·9	286·0
1889	28	187·4	19·2	209·5
1890	24	302·9	40·0	347·2
1891	27	109·4	19·8	133·8
1892	32	84·0	36·6	128·4

OPEN AREA.

Year.	No. of Hauls.	Average Catch per Haul.		
		Flat Fish.	Round Fish.	All Fish.
1886	3	97·2	72·8	171·6
1887	4	129·4	173·3	308·4
1888	5	148·3	72·4	221·2
1889	7	151·4	29·8	183·1
1890	6	29·8	35·6	66·8
1891	6	261·8	30·8	300·1
1892	8	50·3	53·6	105·7

With regard to the increase or decrease of the various kinds of fish within the closed waters, the tables show that there was a great decrease in common dabs, and an increase of flounders, while the abundance of plaice remained the same. Among round-fish there was an increased catch of cod, whitings, and gurnards, and a falling off in haddocks. At the station in the open area there was a decrease of plaice (15·0 as against 48·8 in 1891), common dabs, cod, and whitings, and an increase in flounders and haddocks.

III. SPECIAL STATISTICS OF FISH CAUGHT BY LINE FISHERMEN AND BEAM-TRAWLERS.

1. Relative Quantities of Fish taken by Line and Beam-Trawl.

In considering the influence of beam-trawling on the fish supply, it is necessary to bring into comparison with the results of the trawling experiments certain facts relating to the quantities of flat-fish and round-fish captured by line and trawl in the districts where the trawling experiments are carried on. In Table E. (p. 132) will be found, as in previous years, the statistics showing the quantities of flat-fish and round-fish landed by beam-trawlers and line fishermen in certain important districts on the East Coast, and Table I. shows the relative quantities landed in each month of the year along the whole of the East Coast. The five districts from which special returns have been obtained comprise that portion of the east coast extending between Dunbar on the south and Aberdeen on the north, including both those places. The quantity of fish landed on this portion of the coast by line fishermen and beam-trawlers last year was 804,451 cwts., as against 759,440 cwts. in 1891, or an increase of 45,011 cwts. The increase was entirely due to beam-trawling. In 1891 line fishermen landed 443,868 cwts., and beam-trawlers 315,571 cwts.; while last year the quantity landed by the former class of fishermen was 432,234 cwts., and that by the beam-trawlers 372,216 cwts. Line fishermen thus landed 11,634 cwts. less, and beam-trawlers 56,645 cwts. more, than in the previous year. Of the total quantity 698,281 cwts. were round-fish and 106,170 cwts. were flat-fish; an increase over the quantities for 1891 of 40,776 cwts. of round-fish, and 4,235 cwts. of flat-fish. As will be shown later, the increase in flat-fish is entirely owing to increased catches of halibut and skates by the line fishermen. In regard to the relative quantities of round-fish and flat-fish landed by beam-trawlers and line fishermen, it will be found that while the latter caught a greater quantity of flat-fish than in the previous year, the former caught less. Of the 432,234 cwts. landed by line fishermen, 35,114 cwts. were flat-fish and 397,120 cwts. were round-fish—or an increase of 9,527 cwts. of flat-fish and a decrease of 21,161 cwts. of round-fish as compared with the previous year. Beam-trawlers landed 301,161 cwts. of round-fish and 71,055 cwts. of flat-fish—or an increase of 61,937 cwts. of round-fish and a decrease of 5,292 cwts. of flat-fish.

The gross quantities of white-fish landed by line fishermen and beam-trawlers in the districts referred to during the last four years are given in the following table:—

Year.	Line Boats.			Beam-Trawlers.		
	Flat Fish.	Round Fish.	Total.	Flat Fish.	Round Fish.	Total.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
1889	23,035	453,554	476,589	60,117	155,601	215,718
1890	28,170	430,057	458,227	72,219	208,625	280,844
1891	25,587	418,281	443,868	76,347	239,224	315,571
1892	35,114	397,120	432,234	71,055	301,161	372,216

This table shows that during the period mentioned there has been at this part of the coast, where trawl-caught fish are nearly all landed, a gradual falling off in the quantities of line-caught fish and a considerable increase in the quantities caught by the beam-trawl. Thus, as compared with 1889, there has been a decrease of white-fish landed by line fishermen to the extent of 44,355 cwts., and an increase of 156,498 cwts., or 7824 tons, in the quantities landed by beam-trawlers.

The most important figures in relation to the trawling experiments are those dealing with flat-fish. It will be seen that while the quantity of round-fish caught by beam-trawlers has very greatly increased, from 155,601 cwts. in 1889, to 301,161 cwts. in 1892, or an increase of 93·5 per cent., the quantity of flat-fish in the same period has increased by only 10,938 cwts., or 18·2 per cent. The quantity of flat-fish landed by trawlers last year is less than in 1890 and 1891, although the quantity of round-fish is very much greater. Thus, while trawl-caught round-fish increased in

1892, compared with 1891, by 61,937 cwts., or 25·8 per cent., the flat-fish caught by trawl diminished by 5,292 cwts., or 6·9 per cent. In the case of the line-caught fish, there has been a diminution of round-fish and an increase of flat-fish. The greater quantity of the latter is due entirely to an increased catch of halibut and skates, which are included in the table. The quantities of these fish caught by line in the districts referred to, during the last four years, are as follows:—

	1889.	1890.	1891.	1892.
Halibut .	3,883 cwts.	7,504 cwts.	5,283 cwts.	12,856 cwts.
Skates .	8,342 ,,	9,041 ,,	9,343 ,,	13,235 ,,

Very few halibut are caught by trawl (only 127 cwts. compared with 13,235 cwts. caught by line in the above districts); and when these and skates are taken into account, it will be found that there is a decrease of nearly 2000 cwts. on the other flat-fish—plaice, turbot, flounders, &c.—captured by line fishermen.

The relative quantities of flat-fish and round-fish landed on this part of the coast by beam-trawlers are given in the appended table:—

DISTRICTS.	1891.			1892.		
	Flat Fish.	Round Fish.	Total.	Flat Fish.	Round Fish.	Total.
Leith District.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
1. Line boats, ...	7,167	86,799½	93,966½	7,157¼	87,024	94,181¼
2. Beam-trawlers, . . .	14,762	81,190½	95,952½	14,122	91,583	105,705
Anstruther District.						
1. Line boats, ...	5,017	73,885	78,902	4,840½	81,381	86,221½
Montrose District.						
1. Line boats, ...	3,925¼	103,842½	107,767¾	4,068	94,611	98,679
2. Beam-trawlers, . . .	5,295¼	15,140	20,435¼	5,225½	15,965	21,190½
Stonehaven District.						
1. Line boats, ...	726	45,471	46,197	708	32,284	32,992
Aberdeen District.						
1. Line boats, ...	8,752½	108,283	117,035½	18,341	101,820	120,161
2. Beam-trawlers, . . .	56,290	142,894	199,184	51,708	193,613	245,321
Totals.						
1. Line boats, ...	25,587¾	418,281	443,868¾	35,114¾	397,120	432,234¾
2. Beam-trawlers, . . .	76,347¼	239,224½	315,571¾	71,055½	301,161	372,216½

In Table I. are given the total quantities of flat-fish and round-fish landed during last year along the whole East Coast of Scotland by line-fishermen and beam-trawlers. It shows, as in previous years, that the gross quantity landed by beam-trawlers has increased, while the quantity taken by line has diminished, the falling off in the latter being to the extent of 85,684 cwts. last year as compared with 1891, and of 166,486 cwts. compared with 1888, as the following figures show :—

Year.	Round Fish.		Flat Fish.	
	Line.	Beam-Trawl.	Line.	Beam-Trawl.
	cwts.	cwts.	cwts.	cwts.
1888	1,029,961	179,074	60,752¼	64,723¾
1889	1,057,450	166,818	53,870¾	60,595¾
1890	993,180½	212,475½	58,673	73,141
1891	957,609	227,894½	52,302¼	76,006
1892	859,352½	303,424	64,874½	72,960½

2. Statistics Showing the Quantities of Line-Caught Fish obtained from Territorial Waters.

Special statistics are given in Table G. (p. 147) showing the quantities of fish caught by liners in the territorial waters of the East Coast, from North Berwick on the south to Skateraw, a few miles south of Aberdeen. The monthly and yearly averages per 'shot' for each kind of fish captured are also given; and Table H. (p. 165) indicates the quantities and averages for each district for the last three years.

An examination of the various tables shows that during 1892 there was a decrease in the number of 'shots' in the portion of the territorial waters under consideration, namely, 32,543 as against 37,928 in the previous year. There was also a decline in the quantity of fish caught—both absolutely and in proportion to the number of shots, the average per 'shot' for the year being 1·94 as compared with 2·43 in 1891. Further, both the number of 'shots' and the quantity of fish taken, and also the average catch per 'shot,' were less last year than in any year since the statistics have been obtained. The figures for the various years are as follows :—

Year.	Total Trips or Shots.	Quantity of White Fish caught.	Average Quantity per Shot.
		cwts.	cwts.
1888	43,077	109,396¼	2·539
1889	42,898	107,029¼	2·494
1890	34,501	83,692¼	2·425
1891	37,928	92,469	2·438
1892	32,543	63,420¼	1·94

The falling off in the quantity of fish taken in the territorial waters was common to all kinds, the decrease in haddocks and whitings being specially noticeable. In 1891 the quantity of haddocks amounted to 41,991 cwts. as against 29,235 cwts. last year, and the quantity of whitings decreased from 8,092½ cwts. in 1891 to 2,739½ in 1892. All along the coast a marked feature in the fishing has been the diminished takes of whitings. This is also indicated in the special statistics furnished by Mr Mair, the Fishery Officer of the Anstruther district, showing the quantities of haddocks and whitings captured within the closed and open waters and landed in his district in each of the last five years. They are as follows :—

Year.	Caught within the Closed Area.		Caught outside the Closed Area.		Total.	
	Haddocks.	Whitings.	Haddocks.	Whitings.	Haddocks.	Whitings.
	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
1888	18,419	1,800	17,862	1,131	36,281	2,931
1889	12,499	1,972	19,405	1,645	31,904	3,617
1890	12,418	1,994	10,338	1,595	22,756	3,589
1891	11,981	1,577	11,255	1,244	23,236	2,821
1892	11,718	936	16,647	862	28,365	1,798

3. BUCKHAVEN HADDOCK AND COD LINE FISHING.

The statistics of the cod and haddock line fishing of Buckhaven, specially collected by Mr Mair, the Fishery Officer of the district, since 1884 are given in Table D. (p. 131) for 1891 and 1892. The number of 'shots,' or visits to the fishing grounds in 1892 was less than in the previous year; showing that the falling off, which began in 1887, still continues. The number of 'shots' was 3,112 as against 3,296 in 1891, and 7869 in 1886. Notwithstanding the fewer 'shots' during last year the average catch of fish diminished. In 1891 the average number of cod per 'shot' was 0·91, while last year it fell to 0·4. In haddocks and whiting there was also a considerable falling off. In 1891 the average number of large haddocks captured per 'shot' was exceptionally high—103·8—while last year it was only 50·1; and among small haddocks and whitings there was also a decrease,—from 92·8 in 1891 to 76·9. The figures for the last nine years are as follows:—

Year.	Total Number of 'Shots' during the Year.	Average Number of Cod per 'Shot.'	Average Number of Large Haddocks per 'Shot.'	Average Number of Small Haddocks and Whitings per 'Shot.'
1884	4524	0·34	22·1	38·3
1885	4542	0·50	23·4	221·5
1886	7869	0·32	31·8	147·0
1887	6270	0·23	42·8	208·9
1888	5548	0·45	62·6	228·4
1889	4535	0·46	80·1	68·4
1890	3396	0·72	78·8	130·5
1891	3296	0·91	103·8	92·8
1892	3112	0·44	50·1	76·9

As in previous years the largest proportions of cod were taken in December and January, and of small haddocks and whitings during the summer months.

SUMMARY.

The results of the trawling experiments of 1892 are of the same kind as in the previous year, and show that a diminution and not an increase in the abundance of fishes has taken place in the waters closed against beam-trawling, as well as in the open waters adjacent. Both in the Firth of Forth and St Andrews Bay the falling off in flat fishes has been considerable. In 1891 the average number of such fishes caught in each haul of the trawl within the Firth of Forth was 115·0, while last year it was 106·3; and in St Andrews Bay the corresponding averages were 109·4 in 1891, and 84·0 in 1892. At the stations in the open waters, where trawling is freely carried on, there was also a decrease in the average number of flat fishes caught in each haul—from 50·8 to 43·0 off the Firth of Forth, and from 261·8 to 50·3 off St Andrews Bay. In the closed waters of both areas, on the other hand there was a slight increase in the average number of round fishes captured, and a similar but more pronounced increase in these fishes also took place in the open waters. As stated in previous reports, it is to be expected that considerable fluctuations should occur from year to year in the abundance of fish on these grounds, especially in the more migratory round fishes. But it is remarkable that flat fishes should continue to indicate a steady decline in numbers, notwithstanding the prohibition of beam-trawling within the territorial waters. The statistics of the 'Garland's' trawling experiments during the last seven years in the closed and open waters of St Andrews Bay and the Firth of Forth are as follows, the figures indicating the average number of fishes obtained in each haul of the net in each of the years mentioned :—

Year.	Closed Area.			Open Area.		
	Flat Fish.	Round Fish.	Total.	Flat Fish.	Round Fish.	Total.
1886	131·1	79·6	213·9	70·6	54·6	128·5
1887	270·6	115·9	390·1	109·0	148·3	261·0
1888	163·9	80·5	248·7	90·4	93·5	186·2
1889	148·2	34·5	187·1	94·8	49·2	147·5
1890	201·9	80·9	288·0	41·7	110·1	154·2
1891	112·2	43·7	161·6	156·3	34·7	196·5
1892	95·1	53·9	156·4	46·6	63·3	112·5

In order that comparison may be made between the results obtained in the first few years following the prohibition of trawling and those obtained in the last few years, they have been reduced to averages as follows :—

Years.	Closed Area.			Open Area.		
	Flat Fish.	Round Fish.	Total.	Flat Fish.	Round Fish.	Total.
1886–1888	188·6	92·0	284·2	90·0	98·	191·9
1890–1892	136·4	59·5	201·6	31·5	67·7	154·4

From these figures it is evident that flat fishes and round fishes have diminished in numbers both in the closed and in the open waters. Further examination of the trawling records shows that, comparing the first three with the last three years, a very considerable decrease has occurred in the closed waters in the abundance of plaice, lemon soles and haddocks. Gurnards have also diminished to a slight extent, and dabs have likewise decreased in St Andrews Bay. The annual mean number of plaice captured per 'shot' of the net in the closed waters, has fallen from 90·4 in the period 1886–1888 to 70·4 in the years 1890–1892, or a decrease of 20·0. Lemon soles have fallen from 15·2 to 6·3, or a decrease of 8·9 per 'shot'; dabs have declined from 80·8 to 57·4, or a difference of 23·4. On the other hand, flounders and witch soles have increased to a very slight extent (0·15 and 0·2 respectively). Among round fishes, the average number of cod caught has increased from 6·0 to 9·0, and of whitings from 9·7 to 20·8, but haddocks have diminished from 55·7 to 11·5, and gurnards from 20·7 to 18·0. The averages referring to the open areas bring out similar results, with the difference that dabs have increased and flounders slightly decreased in numbers. As has been said, a certain and indefinite amount of natural fluctuation, due to variations in the condition of the weather, &c., must be taken into account in considering these trawling statistics. But it is improbable that this is the principal explanation of the gradual and considerable decline in the abundance of the food fishes which the figures disclose. And it must be borne in mind that these figures refer to nearly 150,000 fishes captured in about 700 hauls of the net on the same grounds. It would rather appear that the collective results of the 'Garland's' observations point to general over-fishing, especially, as was indicated in last year's report, in the extra-territorial waters where the food fishes mostly spawn; and thus the normal supply of floating fish eggs and larval fishes does not reach the inshore grounds. It is a noteworthy circumstance that although the prohibition of beam-trawling in territorial waters must have served to protect immature plaice (owing to their very special distribution) more than the young of other fishes, this fish is diminishing in abundance year by year.

T. WEMYSS FULTON,
Superintendent of Scientific Investigations.

TABLE A.—SHOWING SUMMARY OF FISH TAKEN BY THE 'GARLAND' IN TRAWLING OPERATIONS IN 1891.

Station and Date.	Flat-Fish.									Round-Fish.					Skate.	Other Fish.	Total.
	Plaice.	Lemon Soles.	Witch Soles.	Common Dabs.	Long Rough Dabs	Flounders.	Turbot.	Brill.	Total.	Cod.	Haddocks.	Whitings.	Gurnards.	Total.			
FIRTH OF FORTH—																	
Station I.																	
Jan. 19, .	1	19	.	40	19	.	.	.	79	15	.	26	.	41	4	10	134
Feb. 18, .	2	17	.	9	25	.	.	.	53	17	.	10	.	27	.	17	97
Mar. 11, .	12	12	.	12	14	2	.	.	52	41	1	7	.	49	2	17	120
April 26, .	34	30	.	20	4	6	.	.	94	9	2	1	8	20	3	11	128
May 17, .	33	46	.	42	12	1	.	.	134	4	2	2	91	99	2	10	245
June 10, .	19	39	.	21	4	.	.	.	83	48	5	2	62	117	.	29	229
July 23, .	97	59	.	73	27	.	.	.	256	10	1	4	41	56	1	32	345
Sept. 21, .	92	73	.	219	31	.	.	.	415	31	3	38	33	105	4	6	530
Oct. 21, .	4	8	.	5	18	.	.	.	35	16	8	165	1	190	1	4	230
Nov. 23, .	3	28	.	6	46	.	.	.	83	53	3	5	2	63	5	5	156
Dec. 16, .	1	5	.	5	58	.	.	.	69	8	2	3	.	13	7	10	99
	298	336	.	452	258	9	.	.	1353	252	27	263	238	780	29	151	2313
Station II.																	
Jan. 19, .	1	.	.	2	5	.	.	.	8	7	8	2	.	17	4	1	30
Feb. 18, .	19	1	.	5	10	.	.	.	35	1	.	.	.	1	.	.	36
Mar. 11, .	19	1	.	24	9	4	.	.	57	.	.	1	.	1	1	4	63
April 21, .	40	2	.	30	5	12	.	.	89	1	5	1	11	18	.	1	108
May 19, .	41	10	.	35	20	.	.	.	106	.	.	.	87	87	.	6	199
June 10, .	64	23	.	40	13	2	1	.	143	1	15	1	75	92	1	1	237
July 20, .	87	29	.	78	23	.	.	.	217	1	7	17	42	67	1	6	291
Sept. 21, .	98	51	.	355	21	.	.	.	525	9	27	17	128	181	2	7	715
Oct. 27, .	33	4	.	78	21	.	.	.	136	.	90	59	15	164	.	.	300
Nov. 23, .	1	.	.	1	2	.	.	.	4	2	1	3	.	6	1	.	11
Dec. 22, .	31	2	.	5	4	.	.	.	42	.	4	1	.	5	.	1	48
	434	123	.	653	133	18	.	.	1362	22	157	102	358	639	10	27	2038
Station III.																	
Jan. 15, .	.	14	.	66	27	.	.	.	107	44	3	79	.	126	1	8	242
Feb. 23, .	2	5	.	20	.	.	.	.	27	15	1	40	.	56	2	32	117
Mar. 11, .	5	11	.	8	25	.	.	.	49	29	.	22	.	51	1	6	107
April 25, .	12	27	.	39	47	5	.	.	130	11	.	18	14	43	.	8	181
May 20, .	11	38	.	56	25	1	.	.	131	5	.	8	138	151	.	3	285
June 13, .	63	47	.	75	44	3	.	.	232	8	12	11	65	96	1	4	333
July 25. .	65	54	.	102	36	.	.	.	257	19	.	31	54	104	1	10	372
Sept. 22, .	21	54	.	52	32	.	.	1	160	20	20	39	28	107	4	8	279
Oct. 21, .	.	2	.	1	7	.	.	.	10	3	15	54	1	73	.	.	83
Nov. 22, .	.	.	.	.	1	.	.	.	1	2	.	2	.	4	.	.	5
Dec. 16, .	6	4	.	8	23	.	.	.	41	21	.	15	1	37	.	2	80
	185	256	.	427	267	9	.	1	1145	177	51	319	301	848	10	81	2084

TABLE A.—SHOWING SUMMARY OF FISH TAKEN BY THE 'GARLAND' IN TRAWLING OPERATIONS IN 1891—*continued.*

Station and Date.	Flat-Fish.									Round-Fish.					Skate.	Other Fish.	Total.
	Plaice.	Lemon Soles.	Witch Soles.	Common Dabs.	Long Rough Dabs.	Flounders.	Turbot.	Brill.	Total.	Cod.	Haddocks.	Whitings.	Gurnards.	Total.			
FIRTH OF FORTH—*continued.*																	
Station IV.																	
Jan. 22, .	23	1	.	4	8	.	.	1	37	8	.	7	.	15	.	16	68
Feb. 23, .	76	.	.	11	1	2	.	.	90	6	.	31	.	37	2	4	133
Mar. 12, .	114	.	.	11	.	.	.	.	125	1	.	.	.	1	.	.	126
April 25, .	89	5	.	13	.	1	.	.	108	2	.	.	9	11	1	2	122
May 21, .	134	3	.	29	7	.	.	.	173	8	.	1	40	49	8	5	235
June 14, .	80	14	.	38	7	.	.	.	139	12	.	2	30	44	10	9	202
July 25, .	168	20	.	40	4	1	.	.	253	12	.	43	39	94	4	8	339
Sept. 20, .	16	.	.	1	.	.	.	.	17	2	.	2	2	6	1	1	25
Oct. 26, .	147	5	.	39	2	.	.	.	193	12	2	11	.	25	.	1	219
Nov. 22, .	144	2	.	25	4	.	.	.	175	4	.	.	1	5	.	2	182
Dec. 23, .	77	1	.	16	3	.	.	.	97	2	.	1	.	3	.	1	101
	1068	51	.	227	36	4	.	1	1387	69	2	98	121	290	26	49	1752
Station V.																	
Jan. 21, .	4	1	2	16	24	.	.	.	47	12	40	30	.	82	5	1	135
Feb. 24, .	5	2	2	7	68	.	.	.	84	13	30	24	.	67	1	4	156
Mar. 16, .	9	4	4	7	106	1	.	.	131	20	18	35	.	73	5	3	212
May 2, .	3	2	.	4	73	.	.	.	82	8	5	36	36	85	.	2	169
May 18, .	11	10	4	3	15	.	.	.	43	.	9	4	5	18	.	3	64
June 13, .	20	18	2	11	50	.	.	.	101	11	61	9	33	114	3	1	219
July 22, .	30	9	4	19	129	.	.	.	191	8	298	13	29	348	2	1	542
Sept. 14, .	43	6	1	9	188	1	.	.	248	.	68	84	10	162	2	.	412
Oct. 24, .	2	.	3	1	8	.	.	.	14	11	129	123	.	263	2	.	279
Nov. 24, .	1	2	.	1	15	.	.	.	19	8	33	4	.	45	.	1	65
Dec. 19, .	5	.	5	4	38	.	.	.	52	16	95	4	.	115	1	1	169
	133	54	27	82	714	2	.	.	1012	107	786	366	113	1372	21	17	2422
Station VI.																	
Jan. 23, .	78	2	.	4	.	.	.	1	85	6	.	.	.	6	.	1	92
Feb. 24, .	52	2	.	2	1	1	.	1	60	8	3	2	.	13	.	1	74
Mar. 16, .	30	3	.	7	1	.	.	.	41	11	.	1	.	12	.	2	55
April 26, .	24	3	.	5	.	1	1	.	34	4	1	.	.	5	.	1	40
May 20, .	24	16	.	5	.	.	1	.	46	2	.	.	3	5	.	11	62
June 15, .	12	4	.	3	.	.	.	1	20	1	.	.	42	43	.	1	64
July 20, .	15	13	.	25	.	.	1	.	54	1	2	3	109	115	.	5	174
Sept. 14, .	93	13	.	117	.	.	.	.	223	12	12	3	40	67	.	8	298
Oct. 24, .	80	22	.	18	.	.	.	1	121	11	9	9	4	33	.	2	156
Nov. 24, .	108	7	.	4	1	.	.	.	120	4	6	1	1	12	1	1	134
Dec. 22, .	9	15	.	4	8	.	.	.	36	17	26	2	.	45	2	.	83
	525	100	.	194	12	2	3	4	840	77	59	21	199	356	3	33	1232
Station VII.																	
Jan. 15, .	1	.	2	8	20	.	.	.	31	5	3	22	.	30	1	1	63
Feb. 26, .	2	2	.	9	7	.	.	.	20	1	7	9	.	17	7	6	50
Mar. 14, .	28	2	.	26	13	1	.	.	70	12	2	5	.	19	5	1	95
May 2, .	13	8	.	58	2	.	.	.	81	.	1	2	124	127	2	1	211
May 18, .	45	2	.	113	10	.	.	.	170	.	4	5	140	149	.	8	327
June 15, .	22	6	.	116	5	1	.	.	150	.	5	2	35	42	2	3	197
July 27, .	25	17	.	221	14	.	1	.	278	.	94	9	52	155	2	10	445
Sept. 14, .	7	5	.	172	.	.	1	.	185	.	53	7	69	129	.	3	317
Oct. 26, .	18	3	4	10	33	.	.	.	68	4	232	70	3	309	2	3	382
Nov. 25, .	2	.	5	2	18	.	.	.	27	1	140	2	1	144	3	.	174
Dec. 15, .	.	.	.	4	8	.	.	.	12	.	81	5	.	86	.	.	99
	163	45	11	739	130	2	2	.	1092	23	622	138	424	1207	24	37	2360

TABLE A.—SHOWING SUMMARY OF FISH TAKEN BY THE 'GARLAND' IN TRAWLING OPERATIONS IN 1891—*continued.*

Station and Date.	Flat-Fish.									Round-Fish.							
	Plaice.	Lemon Soles.	Witch Soles.	Common Dabs.	Long Rough Dabs	Flounders.	Turbot.	Brill.	Total.	Cod.	Haddocks.	Whitings.	Gurnards.	Total.	Skate.	Other Fish.	Total.
FIRTH OF FORTH—*continued.*																	
Station VIII.																	
Jan. 14,	.	.	.	5	28	.	.	.	33	1	16	160	.	177	3	2	215
Feb. 19,	4	3	4	8	31	.	.	.	50	13	40	7	.	60	1	3	114
Mar. 15	1	2	2	14	13	1	.	.	33	19	38	4	.	61	1	2	97
May 9,	2	.	1	10	35	.	.	.	48	1	5	21	48	75	4	5	132
May 25,	.	.	.	.	4	1	.	.	5	.	1	1	2	4	.	.	9
June 9,	5	4	1	20	22	.	.	.	52	.	28	3	.	31	.	4	87
July 21,	5	1	9	23	75	.	.	.	113	.	83	31	72	186	5	2	306
Sept. 13,	.	.	.	.	2	.	.	.	2	.	2	.	.	2	.	.	4
Oct. 25,	3	2	2	3	51	.	1	.	62	9	151	40	1	201	5	6	274
Dec. 2,	.	.	2	1	31	.	.	.	34	6	62	5	.	73	1	1	109
Dec. 20,	.	.	2	2	34	.	.	.	38	2	53	4	.	59	1	.	98
	20	12	23	86	326	2	1	.	470	51	479	276	123	929	21	25	1445
Station IX.[1]																	
Jan. 14,	.	.	.	4	7	.	.	.	11	1	4	3	.	8	.	1	20
Feb. 19,	.	.	.	4	35	.	.	.	39	.	19	16	.	35	3	2	79
Mar. 15,	2	.	1	19	41	1	.	.	64	2	3	7	.	12	.	5	81
May 6,	.	.	.	.	13	.	.	.	13	.	.	7	.	7	.	1	21
May 25,	1	2	4	1	28	.	.	.	36	.	5	11	16	32	.	.	68
June 9,	.	.	.	.	2	.	.	.	2	.	.	.	.	.	.	2	4
July 21,	.	.	.	2	17	1	.	.	20	.	7	7	1	15	.	.	35
Sept. 12,	.	.	2	11	168	.	.	.	181	1	190	75	50	316	4	4	505
Oct. 25,	.	.	.	.	2	.	.	.	2	1	.	3	.	4	.	.	6
Dec. 2,	2	.	.	.	51	.	.	.	53	6	100	9	.	115	.	1	169
Dec. 22,	.	1	1	9	44	.	.	.	55	4	126	4	.	134	3	2	194
	5	3	8	50	408	2	.	.	476	15	454	142	67	678	10	18	1182
Station X.																	
Jan.	No	tra	wlin	g	.	.	.	.	.	.	.	.	.	.	.	.	.
Feb. 5,	.	2	.	2	3	.	.	.	7	4	.	3	.	7	4	2	20
Mar. 1,	6	.	.	.	4	.	.	.	10	8	.	10	.	18	13	10	51
Apr. 12,	1	.	.	.	1	.	.	.	2	3	.	4	.	7	1	1	11
May 24,	2	2	.	.	5	2	.	.	11	3	.	51	.	54	8	3	76
June 14,	.	.	.	.	.	.	.	.	.	3	.	2	.	5	3	1	9
July 26,	2	.	.	.	.	.	.	.	2	4	.	86	.	90	13	3	108
Nov. 26,	.	.	.	.	.	.	.	.	.	1	.	8	.	9	1	2	12
Dec. 24,	1	.	.	.	5	.	.	.	6	14	.	18	.	32	18	16	72
	12	4	.	2	18	2	.	.	38	40	.	182	.	222	61	38	359
ST ANDREWS BAY—																	
Station I.																	
Feb. 9,	6	1	.	23	2	.	.	3	35	.	.	.	.	.	1	28	64
Mar. 8,	5	.	.	8	1	5	.	.	19	3	.	.	.	3	.	38	60
April 15,	17	.	.	47	.	22	1	.	87	.	.	1	10	11	1	.	99
May 13,	20	.	.	85	1	.	.	.	106	.	.	.	73	73	4	1	184
June 8,	163	.	.	107	.	.	.	.	270	.	.	1	149	150	1	1	422
Oct. 7,	1	.	.	1	.	.	.	.	2	.	1	4	3	8	.	1	11
Nov. 7,	15	1	.	2	1	.	2	.	22	.	.	97	15	112	1	.	135
Dec. 8,	3	1	.	4	.	.	.	.	8	3	.	13	.	16	.	3	27
	230	3	.	277	5	27	4	3	549	6	1	116	250	373	8	72	1002

TABLE A.—Showing Summary of Fish taken by the 'Garland' in Trawling Operations in 1891.—*continued.*

Station and Date.	Flat-Fish.									Round-Fish.							
	Plaice.	Lemon Soles.	Witch Soles.	Common Dabs	Long Rough Dabs.	Flounders.	Turbot.	Brill.	Total.	Cod.	Haddocks.	Whitings,	Gurnards.	Total.	Skate.	Other Fish.	Total.
St Andrews Bay—*continued.*																	
Station II																	
Feb. 9, .	7	.	.	9	1	.	.	1	18	1	.	.	.	1	1	11	31
Mar. 8, .	6	.	.	7	.	3	.	.	16	1	.	.	.	1	.	7	24
Apr. 15, .	8	.	.	9	.	13	.	.	30	.	.	.	7	7	3	1	41
May 13, .	22	1	.	75	.	2	.	.	100	.	1	3	126	130	3	1	234
June 9, .	35	.	.	66	.	1	.	.	102	.	.	1	86	87	.	.	189
Oct. 8,	5	.	.	2	.	.	.	.	7	.	.	6	1	7	.	1	15
Nov. 8, .	2	.	.	3	.	.	.	.	5	2	1	51	8	62	1	.	68
Dec. 8, .	2	1	.	2	.	.	.	.	6	5	.	1	.	6	3	3	18
	87	2	.	173	1	19	1	1	284	9	2	62	228	301	11	24	620
Station III.																	
Feb. 8, .	.	.	.	7	1	.	.	.	8	.	.	2	.	2	1	.	11
Mar. 8, .	9	1	.	7	.	4	.	.	21	1	.	1	.	2	.	29	52
Apr. 15, .	20	.	.	27	1	29	.	.	77	.	.	18	.	18	.	9	104
May 13, .	164	.	.	52	2	1	.	.	219	.	2	2	54	58	.	1	278
June 8, .	248	.	.	178	9	.	1	.	436	.	.	.	107	107	3	1	547
Oct. 8, .	35	.	.	12	2	.	.	.	49	8	11	48	2	69	1	1	120
Nov. 8, .	1	.	.	18	1	.	.	.	20	1	6	55	6	68	3	.	91
Dec. 6, .	3	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	3
	480	1	.	301	16	34	1	.	833	10	19	126	169	324	8	41	1206
Station IV.																	
Feb. 9, .	30	.	.	16	.	1	.	.	47	3	3	2	.	8	1	39	95
Mar. 7, .	14	.	.	.	1	2	.	1	18	1	.	.	.	1	.	15	34
Apr. 15, .	92	1	.	5	.	14	.	1	113	.	.	1	1	2	2	7	124
May 12, .	52	.	.	48	.	.	.	.	100	1	.	.	18	19	2	3	124
June 8, .	310	.	.	106	1	5	.	1	423	.	.	.	92	92	7	1	523
Oct. 11, .	202	.	.	43	.	1	.	.	246	6	4	.	18	28	2	1	272
Nov. 9, .	46	.	.	6	.	.	.	.	52	3	4	5	8	15	1	.	68
Dec. 8, .	8	.	.	15	.	2	.	.	25	5	.	9	.	14	2	2	43
	754	1	.	239	2	25	.	3	1024	19	11	17	127	174	17	68	1283
Station V.																	
Feb. 8, .	1	.	.	11	1	.	1	.	14	.	.	3	.	3	.	.	17
Mar. 7, .	6	.	.	11	3	3	.	.	23	.	.	3	.	3	.	.	26
Apr. 15, .	12	.	.	20	3	9	.	.	44	.	5	8	10	23	.	3	70
May 12, .	2	2	.	60	.	.	.	1	65	.	1	2	176	179	3	4	251
June 8, .	37	.	.	60	.	.	.	.	97	.	.	3	120	123	1	.	221
Oct. 11, .	60	1	.	73	.	.	2	.	136	.	10	9	15	34	2	1	173
Nov. 8, .	.	.	.	6	.	.	.	.	6	1	10	5	1	17	.	.	23
Dec. 6, .																	
	120	3	.	251	13	12	3	1	403	1	71	35	322	429	6	8	846

TABLE A.—SHOWING SUMMARY OF FISH TAKEN BY THE 'GARLAND' IN TRAWLING OPERATIONS IN 1891.—*continued.*

Sation and Date.	Flat-Fish.									Round Fish.							
	Plaice.	Lemon Soles.	Witch Soles.	Common Dabs.	Long Rough Dabs.	Flounders.	Turbot.	Brill.	Total.	Cod.	Haddocks.	Whitings.	Gurnards.	Total.	Skate.	Other Fish.	Total.
ST ANDREWS BAY—*continued.*																	
Station VI.																	
Apr. 14, .	1	1	.	7	.	.	.	.	9	.	3	3	6	12	.	3	24
Oct. 11, .	104	.	.	119	.	.	.	.	223	.	48	7	15	70	.	.	293
Nov. 10. .	10	7	.	16	16	.	1	.	50	1	33	20	13	72	2	5	129
Dec. 21, .	6	3	.	4	23	.	.	.	36	9	34	5	.	48	2	.	86
	121	11	.	146	39	.	1	.	318	10	123	35	34	202	4	8	532
Limekilnes.																	
Sept. 22, .	1	1	.	.	.	.	.	.	2	1	.	7	.	8	6	1	17
Oct. 13, .	.	2	.	.	.	.	.	.	2	109	.	109	.	116	7	1	126
	1	3	.	.	.	.	.	.	4	8	.	116	.	124	13	2	143

TABLE B.—ANALYSIS OF THE 'GARLAND'S' STATISTICS RELATING TO THE RELATIVE ABUNDANCE OF FISH.

A. Showing the Average Per 'Shot' of each kind of Fish taken.

Station.	Flat-Fish.									Round-Fish.					Skate.	Other Fish.	Total.
	Plaice.	Lemon Sole.	Witch Sole.	Common Dabs.	Long Roughs.	Flounder.	Turbot.	Brill.	Total.	Cod.	Haddock.	Whiting.	Gurnard.	Total.			
I. *Firth of Forth.*																	
Closed Area.																	
I.	27·0	30·5		41·0	23·4	0·8	–	–	123·0	22·9	2·4	23·9	21·6	70·9	2·6	13·7	210·2
II	39·4	11·1	–	59·3	12·0	1·6	0·09	–	123·8	2·0	14·2	9·2	32·5	58·0	0·9	2·4	185·2
III.	16·8	23·2	–	38·8	24·2	0·8	–	0·09	104·0	16·0	4·6	29·0	27·4	77·0	0·9	7·3	189·4
IV.	97·1	4·6	–	20·6	3·2	0·3	–	0·09	126·0	6·2	0·1	8·9	11·0	26·3	2·3	4·4	159·2
V.	12·0	4·9	2·4	7·4	64·9	0·1	–	–	92·0	9·7	71·4	33·2	10·2	124·7	1·9	1·5	220·1
VI.	47·7	9·1	–	17·6	10·1	0·1	0·2	0·3	76·3	7·0	5·3	1·9	18·1	32·3	0·2	3·0	112·0
VII.	14·8	4·1	1·0	67·1	11·8	0·1	0·1	–	99·2	2·1	56·5	12·5	38·5	109·7	2·1	3·3	214·5
Average per shot of 77 shots.	36·4	12·5	0·4	36·0	20·1	0·5	0·07	0·07	106·3	9·4	22·1	16·8	22·7	71·3	1·5	5·1	184·4
Unclosed Area.																	
VIII.	1·8	1·0	20·9	7·8	29·6	0·1	0·09	–	42·7	4·6	43·5	25·0	11·1	84·4	1·9	2·2	131·3
IX.	0·4	0·2	0·7	4·5	37·0	0·1	–	–	43·2	1·3	41·2	3·8	6·0	61·6	0·9	1·6	107·4
Average per shot of 22 shots.	2·1	0·6	1·4	6·1	33·3	0·1	–	–	43·0	3·0	42·4	14·4	8·6	73·0	1·4	1·5	119·4
II. *St Andrews Bay.*																	
Closed Area.																	
I.	28·7	0·3	–	34·6	0·6	3·3	0·5	0·3	68·6	0·7	0·1	14·5	31·2	46·6	1·0	9·0	125·2
II.	10·8	0·2	–	21·6	0·1	2·3	0·1	0·1	35·5	1·1	0·2	7·7	28·5	37·6	1·3	3·0	77·5
III.	60·0	0·1	–	37·6	2·0	4·2	0·1	–	104·1	1·2	2·3	15·7	21·1	40·5	1·0	5·1	150·7
IV.	94·2	0·1	–	29·8	0·2	3·1	–	0·3	128·0	2·3	1·3	2·1	15·8	21·7	2·1	8·5	160·3
Average per shot of 32 shots.	48·4	0·2	–	30·9	0·7	3·2	0·1	0·2	84·0	1·3	1·0	10·0	24·1	36·6	1·3	6·4	128·4
Unclosed Area.																	
V. Average of 8 shots.	15·0	0·3	–	31·3	1·6	1·5	0·3	0·1	50·3	0·1	8·8	4·3	40·2	53·6	0·7	0·1	105·7

B. SHOWING THE MONTHLY AVERAGE PER 'SHOT' OF EACH KIND OF FISH TAKEN IN 1892.

Date.	Flat-Fish.									Round-Fish.					Skate.	Other Fish.	Total.
	Plaice.	Lemon Sole.	Witch Sole.	Common Dabs.	Long Roughs.	Flounder.	Turbot.	Brill.	Total.	Cod.	Haddock.	Whiting.	Gurnard.	Total.			
I. *Firth of Forth.*																	
Closed Area.																	
Jan.	15·4	5·2	0·5	20·0	14·7	–	–	0·2	56·2	13·8	7·7	23·7	–	45·2	2·1	5·4	109·1
Feb.	22·5	4·1	0·2	9·0	16·1	0·4	–	0·1	52·5	8·7	5·8	16·5	–	31·1	1·7	9·1	94·7
Mar.	31·0	4·7	0·5	13·5	24·0	1·1	–	–	75·0	16·2	3·0	10·1	–	29·4	2·0	4·7	111·1
April	30·7	11·0	–	24·1	18·7	3·5	0·1	–	88·2	5·0	2·0	8·2	28·8	44·1	0·8	3·7	137·0
May	42·7	17·8	0·5	40·4	12·7	0·2	0·1	–	114·7	2·7	2·1	2·8	72·0	79·7	1·4	6·5	202·4
June	40·0	21·5	0·2	43·4	17·5	0·8	0·1	0·1	124·0	11·5	14·0	3·8	48·8	78·2	2·4	6·8	211·5
July	69·5	28·7	0·5	79·7	33·2	0·1	0·2	–	212·2	7·2	57·4	17·1	52·2	134·1	1·5	10·2	358·2
Sept.	52·8	28·8	0·1	132·1	38·8	0·1	0·1	0·1	253·2	10·5	26·1	27·1	44·2	108·1	1·8	4·7	368·0
Oct.	40·5	6·2	1·0	21·7	12·7	–	–	0·1	82·4	8·1	69·2	70·1	3·4	151·0	0·7	1·4	235·5
Nov.	37·0	5·5	0·7	5·5	12·4	–	–	–	61·2	10·5	26·1	2·4	0·7	39·8	1·4	1·2	103·8
Dec.	18·4	3·8	0·7	6·5	20·2	–	–	–	49·8	9·1	29·7	4·4	0·1	43·4	1·4	2·2	97·0
Unclosed Area.																	
Jan.	–	–	–	4·5	17·5	–	–	–	22·0	1·0	10·0	81·5	–	92·5	1·5	1·5	117·5
Feb.	2·0	1·5	2·0	6·0	33·0	–	–	–	44·5	6·5	29·5	11·5	–	47·5	2·0	2·5	96·5
Mar.	1·5	1·0	1·5	16·5	27·0	1·0	–	–	48·5	13·5	20·5	5·5	–	36·5	0·5	3·5	89·0
April	1·0	–	0·5	5·0	24·0	–	–	–	30·5	0·5	2·5	14·0	24·0	41·0	2·0	3·0	76·5
May	0·5	1·0	2·0	0·5	16·0	0·5	–	–	20·5	–	3·0	6·0	9·0	18·0	–	–	38·5
June	2·5	2·0	0·5	10·0	12·0	–	–	–	27·0	–	14·0	1·5	–	15·5	–	3·0	45·5
July	2·5	0·5	4·5	12·5	46·0	0·5	–	–	66·5	–	45·0	19·0	36·5	100·5	2·5	1·0	170·5
Sept.	–	–	1·0	5·5	85·0	–	–	–	91·5	0·5	96·0	37·5	25·0	159·0	2·0	3·0	254·5
Oct.	1·5	1·0	1·0	1·5	26·5	–	0·5	–	32·0	5·0	75·5	21·5	0·5	102·5	2·5	3·0	140·0
Nov.	1·0	–	1·0	0·5	41·0	–	–	–	43·5	6·0	81·0	7·0	–	94·0	0·5	1·0	139·0
Dec.	–	0·5	1·5	5·5	39·0	–	–	–	46·5	3·0	89·5	4·0	–	96·5	2·0	1·0	146·0
II. *St Andrews Bay.*																	
Closed Area.																	
Feb.	10·7	0·2	–	13·7	1·0	0·2	–	1·0	27·0	1·0	0·7	1·0	–	2·7	1·0	19·5	50·2
Mar.	8·5	0·2	–	5·5	0·5	3·5	–	0·2	18·5	1·5	–	0·2	–	1·7	–	22·2	42·5
April	34·2	0·2	–	22·0	0·2	19·5	0·2	0·2	76·7	–	–	5·0	4·5	9·5	1·5	4·2	92·0
May	64·5	0·2	–	65·0	0·7	0·7	–	–	131·2	0·2	0·7	1·2	67·7	70·0	2·2	1·5	205·0
June	189·0	–	–	114·2	2·5	1·5	0·2	0·2	307·7	–	–	0·5	108·5	109·0	2·7	0·7	420·2
Oct.	60·7	–	–	14·5	0·5	0·2	–	–	76·0	3·5	4·0	14·5	4·7	26·7	0·7	1·0	104·5
Nov.	16·0	0·2	–	7·2	0·5	–	0·7	–	24·7	1·5	2·7	52·0	8·0	64·2	1·5	–	90·5
Dec.	4·0	0·5	–	5·2	–	0·5	0·2	–	10·5	4·2	–	5·7	–	9·0	1·2	2·0	22·7
Unclosed Area.																	
Feb.	1	–	–	11	1	–	1	–	14	–	–	3	–	3	–	–	17
Mar.	6	–	–	11	3	3	–	–	23	–	–	3	–	3	–	–	26
April	12	–	–	20	3	9	–	–	44	–	5	8	10	23	–	3	70
May	2	2	–	60	–	–	–	1	65	–	1	2	176	179	3	4	251
June	37	–	–	60	–	–	–	–	97	–	–	3	120	123	1	–	221
Oct.	60	1	–	73	–	–	2	–	136	–	10	9	15	34	2	1	173
Nov.	–	–	–	6	–	–	–	–	6	1	10	5	1	17	–	–	23
Dec.	2	–	–	10	6	–	–	–	18	–	45	2	–	47	–	–	65

LIST OF COMMON AND SCIENTIFIC NAMES (DAY) OF FISH MENTIONED IN THE RETURNS.

Angler,	*Lophius piscatorius.*
Brassie, or Bib,	*Gadus luscus.*
Brill,	*Rhombus lævis.*
Butter-fish,	*Centronotus gunnellus.*
Cat-fish (Wolf-fish),	*Anarrhichas lupus.*
Coal-fish,	*Gadus virens.*
Cod,	*Gadus morrhua.*
Conger,	*Conger vulgaris.*
Dab, common,	*Pleuronectes limanda.*
,, lemon,	*microcephalus.*
,, long rough,	*Hippoglossoides limandoides.*
Dog-fish, picked,	*Acanthias vulgaris.*
Dragonet,	*Callionymus lyra.*
Father lasher,	*Cottus scorpius.*
Flounder,	*Pleuronectes flesus.*
Fluke, sail,	*Arnoglossus megastoma.*
Goby,	*Gobius minutus.*
Gurnard, common,	*Trigla gurnardus.*
,, red,	,, *hirundo.*
Haddock,	*Gadus æglefinus.*
Hake,	*Merluccius vulgaris.*
Halibut,	*Hippoglossus vulgaris.*
Herring,	*Clupea harengus.*
John Dory,	*Zeus faber.*
Ling,	*Molva vulgaris.*
Lump-sucker,	*Cyclopterus lumpus.*
Pipe-fish,	*Syngnathus acus.*
Plaice,	*Pleuronectes platessa.*
Pogge,	*Agonus cataphractus.*
Ray, sandy,	*Raia circularis.*
,, starry,	,, *radiata.*
,, thornback,	,, *clavata.*
Rockling, four-bearded,	*Motella cimbria.*
Rockling, three-bearded,	,, *tricirrata.*
Saithe,	*Gadus virens.*
Skate, gray,	*Raia batis.*
Sole,	*Solea vulgaris.*
,, black,	,, ,,
,, witch,	*Pleuronectes cynoglossus.*
Solenette,	*Solea lutea.*
Sprat,	*Clupea sprattus.*
Turbot,	*Rhombus maximus.*
Whiting,	*Gadus merlangus.*

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH.

E. before the figures indicating temperature means east end of station ; W., west ; N., north ; and S., south.

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.*	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 19th Jan. 1892. 10.25 a.m. to 12.33 p.m.	W. 38·0 E. 38·0	4·0c 4·2c	4·2c 12 fath. 4·8c 14½ fath.	Surface Tow-net. — *Hyperia*, r.; *Parathemisto*, f.; small Ctenophora, f.; very little in this net. Bottom Tow-net. — *Crangon nanus*, f.; *C. allmanni*, f.; *Pandalus annulicornis*, r.; *Mysis lamornæ*, f.; *Mysis ornatus*, f.; *Erythrops goesii*, fr.; *Gastrosaccus spinifer*, r.; *Macropsis slabberi*, r.; *Mysidopsis gibbosa*, r.; *Tryphosa nana*, r.; *Parathemisto oblivia*, fr.; *Pseudocuma cercaria*, r.; *Calanus finmarchicus*, f.; *Sagitta*, sp. c.	Grey skate,†	1	7½	...	...	...	...	*Pecten opercularis*, f.; *Buccinum undatum*, f.; *Mytilus modiolus*, fr.; *Cancer pagurus*, f.; *Portunus holsatus*, f.; *Nephrops norvegicus*, f.; *Ophiothrix rosula*, fr.; *Asterias*, sp. fr.; *Solaster endeca*, f.; *S. papposa*, r.; *Echinus esculentus*, f.; *Chalina oculata*, f.	At beginning—Wind S.E., force 4; weather, fog; sea, strong easterly swell; tide, 4$\frac{35}{60}$ hours ebb; barometer, 29·85; transparency, 1½ fathoms. At finish—Wind, calm; weather and sea as before; tide, ½ hour flood; barometer, 29·87; transparency, 2 fathoms.
					Thornback rays,	1	18	1	14	...	...		
					Starry ray,	1	12	...	...	...	...		
					Plaice,	1	13½	...	...	...	...		
					Lemon soles,	1	15	8	12–14	6	9–11		
					,, ,,	4	6½–8	...	...	...	...		
					Common dabs,	6	8	17	6½	13	5½		
					,, ,,	4	4½	...	...	...	...		
					Long rough dabs,	1	12	4	9	5	7½		
					,, ,,	9	6½	...	...	...	...		
					Cod,	1	29	3	23	3	21		
					,,	3	18	3	13	2	5		
					Whitings,	1	13	2	11	7	8		
					,,	16	6	...	...	...	...		
					Anglers,	1	21	2	13	...	...		
					Cat-fish,	1	34	1	27	3	25		
					Herrings,	1	11½	1	11	...	...		
STATION II. 19th Jan. 1892. 1.23 p.m. to 3.0 p.m.	E. 39·0 W. 39·0	4·8c 4·5c	4·8c 14 fath. 4·9c 12 fath.	Surface Tow-net. — *Hyperia*, sp. r.; *Parathemisto oblivia*, f.; small Ctenophora, f.; very little in net. Bottom Tow-net.—*Hippolyte pusilla*, f.; *Cran-*	Grey skates,	1	15	1	14	...	...	*Cancer pagurus*, fr. (half grown); *Portunus holsatus*, r.; *Solaster papposus*, f.; *As-*	At beginning—Wind, easterly, light; weather, very hazy; sea, strong easterly swell; tide, 1$\frac{25}{60}$ hours flood;
					Thornback ray,	1	11	...	...	...	...		
					Starry ray,	1	6	...	...	...	...		
					Plaice,	1	12	...	...	...	...		
					Common dabs,	1	7½	1	5½	...	...		
					Long rough dabs,	3	7½	1	6½	1	5½		

* sp. = species unidentified ; juv. = young ; r. = rare ; f. = few ; fr. = frequent ; com. = common ; a. = abundant ; v.a. = very abundant.
† The measurement of skates and rays is a measurement of width, and not of length.

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 19th Jan. 1892. 1.23 p.m. to 3.0 p.m. —*continued.*				*gon allmanni, C. nanus*, fr.; *Pandalus annulicornis*, several; *Mysis lamornæ*, fr.; *Gastrosaccus spinifer*, f.; *Erythrops goesii*, fr.; *Boreophausia* sp. f.; *Diastylus*, sp. f.; *Parathemisto oblivia*, fr.; *Calisoma crenata*, f.; *Calanus finmarchicus*, fr.; young herring? Common dabs? and butter fish, f.	Haddocks,	2	22	4	19	1	17	*cidia*, sp. c.; *Alcyonium digitatum*, r.	barometer, 29·87; transparency, 2 fathoms. At finish—Wind E., force 3; weather and sea as before; tide, 3 hours flood; barometer, 29·88; transparency, 1½ fathoms.
					,,	1	10	...	...	...	...		
					Cod,	1	23	3	21	2	11–13		
					,,	1	6	...	...	...	...		
					Whitings,	1	16	1	6½	...	...		
					Cat-fish,	1	25	...	...	...	...		
STATION III. 15th Jan. 1892. 2.37 p.m. to 4.37 p.m.	E. 39·0 W. 34·8	3·7c 4·5c	4·8c 12 fath. 5·0c 10 fath.	Surface Tow-net.—*Parathemisto oblivia*, c.; small Ctenophora, f.; Infusoria, f. Bottom Tow-net.—*Boreophausia*, sp. f.; *Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Sagitta*, sp. c.; *Nerine*, r.	Thornback ray,	1	7	...	...	...	...	*Pecten opercularis*, ab.; *Nephrops norvegicus*, f.; *Solaster papposa*, f.; *Asterias*, sp. f.; *Echinus esculentus*, several.	At beginning—Wind S.E., force 4; weather, hazy; sea, moderate, easterly swell; tide, 5 hours flood; barometer, 29·46; transparency, 2 fathoms. At finish—Wind S., force 3; weather and sea as before; tide, 1 hour ebb; barometer, 29·46; transparency, 2 fathoms.
					Lemon soles,	1	13	4	11½	7	9–10		
					,, ,,	2	6	...	...	...	...		
					Common dabs,	6	9	19	7½	16	6		
					,, ,,	25	5	...	...	...	...		
					Long rough dabs,	1	10	10	8	11	7		
					,, ,,	5	5	...	...	...	...		
					Zeugopterus,	1	3½	...	...	...	...		
					Haddocks,	3	7	...	...	...	...		
					Cod,	1	31	3	20	16	17		
					,,	17	13	1	8	6	7		
					Whitings,	15	11	24	10	19	7		
					,,	21	6	...	...	...	...		
					Anglers,	1	44	1	21	1	14		
					,, ,,	1	13	...	...	...	...		
					Herring,	1	8	...	...	...	...		
					Liparis vulgaris,	2	2½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate, Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 22nd Jan. 1892. 10.27 a.m. to 12.35 p.m.	W. 38·0	3·5c	3·5c 6½ fath.	Surface Tow-net.—*Parathemisto oblivia*, c.; small Ctenophora, f.; very little in the surface tow-net. Bottom Tow-net.—*Parathemisto oblivia*, f.; *Calanus finmarchicus*, fr.; *Caligus rapax*, r.; *Sagitta*, sp. f.; small Ctenophora, fr.; comparatively little in the bottom tow-net.	Plaice,	3	16½	5	14	15	12	*Pecten opercularis*, f.; *Buccinum undatum*, r.; a small quantity of Zoophytes and weed.	At beginning—Wind S.W., force 4; weather, very hazy; sea, slight; tide, 2½ hours ebb; barometer, 29·64; transparency, 1½ fathoms. At finish—Wind, weather, and sea as before; tide, 4½ hours ebb; barometer, 29·67; transparency, 1½ fathoms.
					Lemon soles,	1	7½	...	...	...	...		
					Common dabs,	2	8	2	5½	...	...		
					Long rough dabs,	1	9½	5	7½	2	6		
					Brill,	1	14½	...	...	...	...		
	E. 40·0	3·6c	3·5c 5½ fath.		Cod,	1	30	1	24	4	19		
					,,	2	6	...	...	...	...		
					Whitings,	1	7	3	6	3	5		
					Herrings,	1	11	4	8½		7		
					,,	3	5	...	...	...	...		
					Sprats,	5	4¾	...	...	...	...		
STATION V. 21st Jan. 1892. 1.15 p.m. to 2.50 p.m.	E. 38·0	5·4c	5·1c 25 fath.	Surface Tow-net.—*Atylus bispinosus*, r.; *Calanus finmarchicus*, f.; small Ctenophora, f.; very little in surface-net. Bottom Tow-net. —*Crangon allmanni*, *C. nanus*, fr.; *Mysis ornatus*, fr.; *Pandalus annulicornis*, f.; *Erythrops goesii*, fr.; *Boreophausia*, f.; *Calisoma crenata*, r.; *Iphimedia obesa*, r.; *Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Sagitta*, sp. c.	Thornback rays,	1	17	3	16	1	13	*Buccinum undatum*, r.; *Nephrops norvegicus*, c.; Zoophytes and weed, small quantity.	At beginning—Wind SW., force 4; weather, very hazy; sea, strong S.E. swell; tide, high water; barometer, ; transparency, . At finish — Wind, S.S.W., force 6; weather very hazy; sea, rough; tide, $1\frac{35}{60}$ hours flood; barometer, ; transparency .
					Plaice,	2	14½	1	13½	1	5		
					Lemon soles,	1	13½	...	...	...	...		
					Common dabs,	3	10½	5	9½	4	6		
					,, ,,	4	5	...	...	...	...		
	W. 37·0	5·2c	5·1c 28 fath.		Witch soles,	2	19	...	...	...	...		
					Long rough dabs,	2	9½	12	7½	7	6½		
					,, ,,	3	4½	...	...	...	...		
					Haddocks,	4	19½-17½	10	16	16	14		
					,,	10	11–13	...	...	...	...		
					Cod,	1	40	3	30	2	29		
					,,	1	24	3	20	2	5½		
					Ling,	1	29	...	...	...	...		
					Whitings,	1	15	8	11	7	8–9		
					,,	14	4–6	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Sur-face.	Bot-tom.			No.	Inches	No.	Inches	No.	Inches		
Station VI. 23rd Jan. 1892. 12 noon to 1.0 p.m.	W. 42·0 E. 42·0	4·9c 5 ·0c	5·0c 13 fath. 4·9c 16 fath.	Surface Tow-net. — *Boreophausia*, sp. f.; *Parathemisto oblivia*, fr.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; small Ctenophora, f. Bottom Tow-net. — *Boreophausia*, sp. r.; *Parathemisto oblivia*, f.; *Calanus finmarchicus*, fr.; *Sagitta*, sp. f.; small Ctenophora, f.; young Ophiuridæ, f.; comparatively little in either of the tow-nettings.	Plaice,	2	20½	21	17	31	14	*Buccinum undatum*, r.; *Eupagurus bernhardus*, r.; *Asteria*, sp. f.	At beginning—Wind S.W.; force 4; weather, clear; sea, slight; tide, 3¼ hours ebb; barometer, 29·77; transparency, 3 fathoms. At finish—Wind, weather, and sea as before; tide, 4¼ hours ebb; barometer and transparency as before.
					,,	24	12	...	...	...	...		
					Lemon soles,	1	13	1	12	..	...		
					Common dabs,	1	12	1	9	2	8		
					Brill	1	23	...	...	...	...		
					Cod,	1	22	5	19	...	...		
					Cat-fish,	1	34	...	...	...	...		
Station VII. 15th Jan. 1892. 12.20 p.m. to 1.55 p.m.	E. 38·9 W. 41·0	5·0c 4·2c	5·0c 19 fath. 4·3c 10 fath.	Surface Tow-net.—*Parathemisto oblivia*, fr.; *Hyperia medusarum*, r.; *Calanus finmarchicus*, r.; *Sagitta*, sp. f. Bottom Tow-net. — *Siriella*, sp. r.; *Parathemisto oblivia*, ab.; *Calanus finmarchicus*, fr.; *Sagitta*, sp. ab.	Starry ray,	1	11	...	...	...	..	*Asterias*, sp. f.; *Alcyonium digitatum*, r.; *Flustra*, sp. r.; a small quantity of weed.	At beginning—Wind S.E., force 3; weather, a little hazy; sea, strong easterly swell; tide, 3 hours flood; barometer, 29·46; transparency, 4 fathoms. At finish—Wind, weather, and sea as before; tide, fully 4¾ hours flood; barometer, 29·49; transparency, 3 fathoms.
					Plaice,	1	12½	...	...	...	...		
					Common dabs,	2	11½	2	9½	2	7–8½		
					,, ,,	2	5–5½	...	...	...	...		
					Witch soles,	2	17	...	...	...	...		
					Long rough dabs,	1	12½	1	9½	11	7½		
					,, ,,	7	5½–6½	...	...	...	...		
					Haddocks,	2	12	1	10	...	...		
					Cod,	1	30	3	12½	1	8½		
					Whitings,	1	10	5	9	1	8		
					,,	15	5–6	...	...	...	...		
					Dragonet,	1	8	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VIII. 14th Jan. 1892. 2.20 p.m. to 3.50 p.m.	N.E. 39·0 S.W. 37·5	5·9c 6·4c	6·0c 29 fath. 5·6c 22 fath.	Surface Tow-net. — *Parathemisto oblivia*, f.; *Hyperia medusarum*, r.; *Sagitta*, f.; *Bolinia*, r. Bottom Tow-net. — *Parathemisto oblivia*, c.; *Atylus bispinosus*, c.; *Calanus finmarchicus*, fr.; *Sagitta*, a.	Grey skates,	2	16½	1	15	...	...	*Loligo vulgaris*, r.; *Nephrops norvegicus*, r.; *Solaster endeca*, f.; *Asterias*, sp. f.; a small quantity of weed.	At beginning—Wind S., force 4; weather, clear overhead, hazy round horizon; strong south-easterly lea; tide, 5¾ hours flood; barometer, 29·36; transparency, 6¾ fathoms. At finish — Wind S.S.W., force 4; weather and sea as before; tide, 1¼ hours ebb; barometer, 29·33; transparency, 6 fathoms.
					Common dabs,	3	7½	1	6½	1	5		
					Long rough dabs,	2	8	17	7	6	6		
					,, ,,	3	5	...	...	...	...		
					Haddocks,	3	16½	7	13½	5	10		
					,,	1	6	...	...	...	...		
					Cod,	1	13½	...	...	...	...		
					Whitings,	28	12½	78	10	53	8–9		
					,,	1	4	...	...	...	...		
					Brassie,	1	6½	...	...	...	...		
					Angler,	1	17	...	...	...	...		
STATION IX. 14th Jan. 1892 12.10 p.m. to 1.55 p.m.	S.E. 38·5 N.W. 39·0	5·9c 5·9c	6·0c 33 fath. 6·0c 30 fath.	Surface Tow-net. — *Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Sagitta*, f.; fish ova, r. Bottom Tow-net.—*Boreophausia*, r.; *Parathemisto oblivia*, c.; *Atylus bispinosus*, c.; *Calisoma crenata*, f.; *Calanus finmarchicus*, fr.; *Sagitta*, a.	Common dabs,	3	7	1	6	...	...		At beginning—Wind S., force 4; weather, clear overhead, hazy round horizon; sea, strong south easterly lea; tide, 3½ hours flood; barometer, 29·37; transparency, 7 fathoms. At finish — Wind, weather and sea as before; tide, 5½ hours flood; barometer, 29·36; transparency, 7 fathoms.
					Long rough dabs,	2	7	2	6	3	5		
					Haddocks,	1	14	1	13	1	6		
					,,	1	5	...	...	...	...		
					Cod,	1	5½	...	...	...	...		
					Whitings,	1	10	2	9	...	...		
					Brassie,	1	8	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station I. 18th Feb. 1892. 1.40 p.m. to 3.45 p.m.	E. 35·0	4·6	4·8 6 fath.	Surface Tow-net. — *Parathemisto oblivia*, c.; small Ctenophora, f.; very little in the net.	Plaice,	2	12	...	...	...	...	*Pecten opercularis*, fr.; *Buccinum undatum*, r.; *Nephrops norvegicus*, f.; *Asterias*, sp. f.; *Solaster papposa*, r.; *Echinus esculentus*, f.; a small quantity of mixed Zoophytes and weed.	At beginning — Wind N.N.W., force 3; weather, clear; sea, moderate; tide, 1⅘ hours flood; barometer, 29·30; transparency, 2½ fathoms. At finish—Wind N.N.W., force 4; weather, becoming cloudy; sea, moderate; tide, 3¾ hours flood; barometer, 29·31; transparency, 2 fathoms.
					Lemon soles,	1	15	4	13½	11	9–12		
					,, ,,	1	5	...	...	...	...		
					Common dabs,	2	7½	4	6½	3	5		
	W. 35·0	4·4	4·2 9½ fath.	Bottom Tow-net.— *Boreophausia*, sp. r.; *Parathemisto oblivia*, f.; *Diastylus*, sp. r.; *Endorella truncatula*, f.; *Calanus finmarchicus*, f.; *Dias longiremus*, f.; *Caligus rapax*, r.; *Sagitta*, fr.; small Ctenophora, fr.	Long rough dabs,	2	8	3	7	9	6		
					,, ,,	11	4–5	...	..	...	...		
					Cod,	2	24½	2	20	6	13–15		
					,,	5	5½	1	22½	1	16½		
					Whitings,	1	13	2	10	2	8		
					,,	5	6	...	...	...	...		
					Conger,	1	51	...	...	...	...		
					Anglers,	1	27	1	18½	3	14-15		
					,, ,,	1	12½	...	...	...	...		
					Herrings,	10	9	...	...	...	...		
Station II. 18th Feb. 1892. 11.45 a.m. to 1.15 p.m.	E. 33·0	4·4	4·3 13 fath.	Surface Tow-net. — *Parathemisto oblivia*, r.; *Calanus finmarchicus*, r.; small Ctenophora, r.; very little in net; one fish ovum.	Plaice,	4	15½	3	14½	6	11½	*Asterias*, f.; a quantity of mixed weed and Zoophytes.	At beginning — Wind N.N.W., force 4; weather, clear; sea, moderate; tide, 5¾ hours ebb; barometer, 29·29; transparency, 3 fathoms. At finish — Wind, weather, and sea as before; tide, 1¼ hours flood; barometer, 29·31; transparency, 3 fathoms.
					,,	6	11	...	...	...	...		
					Lemon soles,	1	14	...	...	...	...		
					Common dabs,	1	11	1	7½	2	6½		
					,, ,,	1	5	...	...	...	...		
	W. 35·0	4·4	4·2 13 fath.	Bottom Tow-net. — *Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Sagitta*, r.; small Ctenophora, r.	Long rough dabs,	3	8½	4	7½	3	6½		
					Cod,	1	28	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate, Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 23rd Feb. 1892. 1.35 p.m. to 4.0 p.m.	E. 44·0	3·7	3·8 10 fath.	Surface Tow-net. — *Parathemisto oblivia*, f.; *Calanus finmarchicus*, r.; *Sagitta*, r. Bottom Tow-net. — *Boreophausia*, sp. f.; *Crangon allmanni*, *C. nanus*, several; *Pandalus annulicornis*, f.; *Mysis*, sp. f.; *Erythrops goesii*, fr.; *Parathemisto oblivia*, fr.; *Ampelisca*, sp. r.; *Dexamine*, sp. r.; *Atylus bispinosus*, r.; *Calanus finmarchicus*, fr.; *Sagitta*, c.	Thornback rays, .	1	13	1	11½	...	...	*Fusus antiquus*, r.; *Cancer pagurus*, f.; *Portunus holsatus*, r.; lobsters, 1 half grown (injured); *Nephrops norvegicus*, fr.; *Asterias*, sp. f.; *Solaster papposus*, fr.; *Alcyonium*, sp. f.; *Actinoloba dianthus*, several; *Flustra*, sp. f.	At beginning — Wind E., force 3; weather, hazy; sea, strong easterly swell; tide, 3½ hours ebb; barometer, 29·74; transparency, 2 fathoms. At finish—Wind E., force 4; weather, hazy; sea, strong easterly swell; tide, 5¾ hours ebb; barometer, 29·75; transparency, 2 fathoms.
					Plaice, . .	1	15½	1	13	...	...		
					Lemon soles, .	1	14	2	13	2	11		
					Common dabs, .	3	9	2	8	10	7		
	W. 44·0	4·2	3·5 11 fath.		,, ,, .	5	6	...	...	...	...		
					Haddock, . .	1	14½	...	...	...	...		
					Cod, . . .	1	24	3	19	5	15		
					,, . . .	6	5½–8	...	...	...	...		
					Whitings, . .	1	8	22	7	17	6		
					Anglers, . .	1	37	4	18	1	16		
					Cat-fish, . .	1	28	...	...	...	...		
					Herrings, . .	8	9½	5	8½	7	7½		
					,, . .	1	6	...	...	...	...		
					Sprats, . .	2	5	2	4½	...	...		
STATION IV. 23rd Feb. 1892. 10.30 a.m. to 1.0 p.m.	W. 44·5	3·0	3·0 4½ fath.	Surface Tow-net. — *Parathemisto oblivia*, r.; *Sagitta*, r.; Infusoria, fr.; very little in net. Bottom Tow-net.— *Crangon allmanni*, r.; *Mysis flexuosus*, f.; *Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; *Nerine*, sp. r.; *Sagitta*, f.; small Ctenophora, fr.	Starry rays, .	1	11½	1	8½	...	...	*Pecten opercularis*, fr.; *Mytilus modiolus*, f.; *Buccinum undatum*, f.; *Fusus antiquus*, r.; *Portunus*, sp, f.; *Hyas araneus*, r.; *Asterias*, sp. f.; *Solaster papposus*, r.; *Echinus miliaris*, r.; *Alcyonium*, sp. f.; *Chalina*, sp. f.; *Flustra*, sp. f.	At beginning—Wind S.E., force 4; weather, very hazy; sea, slight; tide, ½ hour ebb; barometer, 29·72; transparency, 1½ fathoms. At finish—Wind, E., force 3; weather, hazy; sea, easterly swell; tide, 3 hours ebb; barometer, 29·74; transparency, 2 fathoms.
					Plaice, . .	2	16	6	14	40	13		
					,, . .	28	9–11	...	...	...	...		
	E. 43·0	3·8	3·1 7 fath.		Common dabs, .	3	9	6	7½	2	5½		
					Flounders, . .	1	6	1	9	...	...		
					Long rough dab,	1	7	...	...	...	...		
					Cod, . . .	1	19	1	15½	1	13		
					,, . . .	3	6–7	...	...	...	...		
					Whitings, . .	1	10	1	8½	14	6		
					,, . .	15	4½	...	...	...	...		
					Herrings, . .	1	8½	1	7½	1	2½		
					Liparis, sp.	1	3½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION V. 24th Feb. 1892. 12.18 p.m. to 2.20 p.m.	W. 43·0 E. 42·0	4·3 4·5	4·0 29 fath. 4·1 27 fath.	Surface Tow-net.—*Parathemist ooblivia*, f.; scarcely anything in the net. Bottom Tow-net.—*Crangon allmanni*, fr.; *Erythrops goesii*, fr.; *Tauria medusarum*, r.; *Atylus bispinosus*, *A. nanus*, f.; *Sagitta*, c.; small Ctenophora, fr.	Thornback ray,	1	15	...	...	...	...	*Fusus antiquus*, r.; *Nephrops norvegicus*, f.; *Hyas araneus*, r.; *Solaster papposa*, r.; *Echinus esculentus*, r.	At beginning—Wind S.S.E., force 3; weather, very hazy; sea, strong easterly swell; tide, ¾ hour ebb; barometer, 29·78; transparency, 2 fathoms. At finish—Wind S.E. by E. ¼ E., force 4; weather and sea as before; tide, 2¾ hours ebb; barometer, 29·78; transparency, 3½ fathoms.
					Plaice,	3	14	2	13	...	...		
					Lemon soles,	1	10	1	7	...	...		
					Common dabs,	1	12	2	10	3	8½		
					,, ,,	1	6	...	...	...	...		
					Witches,	1	19	1	17	...	...		
					Long rough dabs,	11	9½	9	7	47	5–6		
					,, ,,	1	3	...	...	...	...		
					Haddocks,	1	25	2	20	2	15½		
					,,	15	14	5	12	3	11		
					,,	2	7	...	...	...	...		
					Cod,	1	32	2	28½	2	23½		
					,,	3	23	3	19	1	7		
					,,	1	5	...	...	...	...		
					Whitings,	3	11	3	8½	17	6½		
					,,	1	4	...	...	...	...		
					Ling,	1	15	...	...	...	...		
					Herrings,	2	8	...	...	...	...		
					Three-bearded Rockling,	1	9	...	...	...	...		
STATION VI. 24th Feb. 1892. 3.12 p.m. to 4.0 p.m.	E. 41½·0 W. 43·0	4·0 4·2	4·1 10½ fath. 4·1 16 fath.	Surface Tow-net.—*Parathemisto oblivia*, f.; *Sagitta*, r.; young rockling, 1. Bottom Tow-net.—*Boreophausia*, sp. r.; *Atylus bispinosus*, f.; *Calanus finmarchicus*, fr.; *Sagitta*, fr.	Plaice,	2	19–21	16	16	33	13–14	*Asterias*, rare; otherwise *nil.*	At beginning—Wind S.E. by E. ½ E., force 5; weather, very hazy; sea, strong easterly swell; tide, 3½ hours ebb; barometer, 29·79; transparency, 1¾ fathoms.
					,,	1	9	...	...	...	...		
					Lemon soles,	1	14	1	13	...	...		
					Common dab,	1	6	1	5	...	...		
					Flounder,	1	11	...	...	...	...		
					Long rough dab,	1	7	1	5	...	...		
					Brill,	1	14	...	...	...	...		
					Haddocks,	1	16	2	15	...	...		
					Cod,	1	22	2	20	3	19		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Sur-face.	Bot-tom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 24th Feb. 1892. 3.12 p.m. to 4.0 p.m.—*continued.*					Cod,	2	13½	...	...	...	...		At finish—Wind S.E., force 4; weather and sea as before; tide, 4¼ hours ebb; barometer, 29·79; transparency, 1¾ fathoms.
					Whitings,	1	18	1	16	...	...		
					Cat-fish,	1	27	...	...	...	...		
STATION VII. 26th Feb. 1892. 12.20 p.m. to 2.20 p.m.	E. 43·0 W. 14·0	4·4 4·4	4·1 19 fath. 4·1 10 fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Sagitta*, r. Bottom Tow-net. — *Pandalus annulicornis*, r.; *Crangon nanus*, f.; *Crangon allmanni*, f.; *Crangon neglectus*, r.; *Virbius fassiger*, r.; *Boreophausia*, f.; *Mysis ornatus*, f.; *Siriella armata*, r.; *Erythrops goesii*, fr.; *Chiromysis*, sp. r.; *Diastylis*, sp. f.; *Parathemisto oblivia*, fr.; *Atylus bispinosus*, r.; *A. swammerdami*, f.; *Monoculodes longimanus*, r.; *Calisoma crenata*, r.; *Dexamine*, sp. f.; *Sagitta*, fr.; *Tomopteris*, f.; young goby, 1.	Starry rays,	1	10	1	8	3	7	*Solaster papposa*, r.; *Solaster endeca*, r.; *Asterias*, sp. r.; *Astropecten irregularis*, r.	At beginning — Wind S.E., force, 2; weather, very hazy; sea, strong easterly swell; tide, 5¼ hours flood; barometer, 30·05; transparency, 2 fathoms. At finish—Wind E.S.E., force 3; weather and sea as before; tide, ¼ hour ebb; barometer, 30·06; transparency, 1½ fathoms.
					,,	2	5½	...	...	...	...		
					Plaice,	1	12	1	9	...	...		
					Lemon soles,	1	8½	1	6	...	...		
					Common dabs,	1	8	4	7	2	6		
					,, ,,	2	4¼	...	...	...	...		
					Long rough dabs,	1	8	3	7	2	6		
					,, ,,	1	5	...	..	...	...		
					Haddocks,	2	15	3	14	2	13		
					Cod,	1	5	...	..	...	...		
					Whitings,	1	14	1	8	6	6		
					,,	1	4	...	...	...	...		
					Pogge,	1	5½	2	4½	3	4		
STATION VIII. 19th Feb. 1892. 12.20 p.m. to 2.20 p.m.	S.W. 35	5·0	4·4 21 fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Sagitta*, r.; scarcely anything in net. Bottom Tow-net. — *Boreophausia*, sp. f.; *Mysis*	Grey skate,	1	16	...	...	...	...	*Buccinum undatum*, several; *Nephrops norvegicus*, f.; *Asterias*, f.; *Echinus esculentus*,	At beginning — Wind N., force 3; weather, cloudy; sea, slight; tide, low water; barometer, 29·45;
					Plaice,	1	19½	2	15	1	11½		
					Lemon soles,	1	12	2	10	...	...		
					Common dabs,	7	6½	1	5	...	...		
					Witch soles,	2	8½	2	17	...	...		
					Long rough dabs,	11	7½	16	6	2	5		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VIII. 19th Feb. 1892. 12.20 p.m. to 2.20 p.m. —*continued.*	N.E. 34·0	4·6	4·2 26½ fath.	sp. f.; *Siriella*, sp. f.; *Parathemisto oblivia*, f.; *Atylus bispinosus*, f.; *Calisoma crenata*, r.; *Phoxus*, sp. r.; *Calanus finmarchicus*, f.; *Sagitta*, c.	Long rough dabs,	2	4	...	...	...	...	r.; *Alcyonium*, r.	transparency, 3 fathoms. At finish—Wind N.E., force 3; weather, cloudy; sea, easterly swell; tide, 2 hours flood; barometer, 29·45; transparency, 4 fathoms.
					Haddocks,	5	15–16	15	14	16	12		
					,,	4	11	...	...	...	...		
					Cod,	2	30½	1	26	2	18		
					,,	8	12–14	...	...	...	...		
					Whitings,	1	14	1	13	5	5½		
					Brassie,	2	6½	...	...	...	...		
					Sprat,	1	5	...	...	...	...		
STATION IX. 19th Feb. 1892. 3.15 p.m. to 5.0 p.m.	S.E. 33·0	4·7	4·8 30 fath.	Surface Tow-net.—*Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; very little in net.	Grey skates,	1	16	1	14	...	...	*Fusus antiquus*, r.; *Buccinum undatum*, r.; *Asterias*, sp. r.; *Nephrops norvegicus*, f.	At beginning—Wind N.E., force 3; weather, cloudy; sea, strong easterly swell; tide, 3 hours flood; barometer, 29·44; transparency, 4½ fathoms. At finish—Wind E., force 2; weather, cloudy; sea, strong easterly swell; tide, 4¾ hours flood; barometer, 29·45; transparency, 3½ fathoms.
					Starry ray,	1	8½	...	...	...	...		
					Common dabs,	1	8	3	5½	...	...		
					Long rough dabs,	8	8	16	6½	11	5		
	N.W. 33·5	4·7	4·3 27½ fath.	Bottom tow-net.—*Boreophausia*, sp. f.; *Mysis*, sp. r.; *Atylus bispinosus*, f.; *Parathemisto*, f.; *Calanus finmarchicus*, f.; *Sagitta*, c.	Haddocks,	1	19	1	17	16	11–14		
					,,	1	7	...	...	...	...		
					Whitings,	3	11	1	9½	1	7		
					,,	11	5	...	...	...	...		
					Brassie,	1	8	...	...	...	...		
					Three-bearded Rockling,	1	9	...	...	...	...		
STATION X. 5th Feb. 1892. 11.50 a.m. to 12.45 p.m.	W. 41·0	4·0c	4·0c 7 fath.	Surface Tow-net.—*Macropsis slabberi*, r.; *Parathemisto oblivia*, f.; very little in net. Bottom Tow-net.—*Crangon allmanni*, r.; *Mysis flex-*	Thornback rays,	1	12	1	10	1	8	*Hyas Araneus*, f.; *Actinia*, r.; a quantity of *Sabellæ*—hardened mud.	At beginning—Wind W. by N., force 7; weather, moderately clear; sea, rough; tide, 4¼ hours ebb; barometer, 29·37;
					,, ,,	1	6	...	...	...	...		
					Lemon soles,	1	14	1	8½	...	...		
					Common dabs,	1	8	1	5	...	...		
					Long rough dabs,	2	6½	1	6	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION X. 5th Feb. 1892. 11.50 a.m. to 12.45 p.m.—*continued.*	E. 44·0	4·2c	4·0c 9 fath.	*uosus*, f.; *Mysis ornatus*, fr.; *Mysis spiritus*, fr.; *Mysis harmona*, f.; *Mysidopsis gibbosa*, r.; *Gastrosaccus sanctus* r.; *Macropsis slabberi*, f.; *Parathemisto oblivia*, fr.	Cod,	1	25	1	20	1	16½		transparency, ½ fathom. At finish — Wind, weather, and sea, as before; tide, 5¼ hours ebb; barometer, 29·40; transparency, ½ fathom.
					,,	1	11	...	...	...	...		
					Whitings,	1	12½	1	6½	1	5½		
					Herrings,	1	9½	...	...	...	...		
					Pogge,	1	5¾	...	...	...	...		
STATION I. 11th Mar. 1892. 1.42 p.m. to 3.35 p.m.	W. 37·0 E. 36·0	38·1 38·4	38·2 15 fath. 38·4 14½ fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Calanus finmarchicus*, r. Bottom Tow-net.—*Crangon allmanni*, r.; *Crangon nanus*, f.; *Mysis lamornæ*, r.; *Mysis ornata*, f.; *Erythrops goesii*, c.; *Caligus rapax*, f.; *Sagitta*, fr.; small Ctenophora, f.	Thornback rays,	1	16½	1	8½	...	...	*Pecten opercularis*, f.; *Mytilus modiolus*, f.; *Buccinum undatum*, f.; *Asterias*, sp. f.; *Solaster papposa*, f.; *Echinus esculentus*, f.	At beginning — Wind N.E., force 4; weather, cloudy; sea, strong easterly swell; tide, high water; barometer, 29·69; transparency, 2½ fathoms. At finish—Wind, weather, and sea, as before; tide, about 2 hours ebb; barometer, 29·68; transparency, 3 fathoms.
					Plaice,	3	15	4	14	5	10		
					Lemon soles,	1	14	2	13	6	11		
					,, ,,	3	8	...	...	...	...		
					Common dabs,	3	8	3	7	4	6		
					,, ,,	2	5	..	...	...	...		
					Flounders,	1	12	1	9	...	...		
					Long rough dabs,	9	7	4	6	1	5		
					Haddock,	1	10	...	...	...	...		
					Cod,	15	20-22	17	14–16	1	12		
					,,	8	6–8	...	...	...	...		
					Whitings,	1	12	2	10	4	5		
					Cat-fish,	2	40	3	37	5	34		
					,,	2	31	2	29	2	26		
					Sprats,	1	4½	...	...	...	...		
STATION II. 10th March 1892. 2.10 p.m. to 3.40 p.m.	E. 37·0	38·7	38·8 11½ fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Calanus finmarchicus*, f.; *Sagitta*, r.; small Ctenophora, f.; fish ova, f.	Thornback ray,	1	14	...	...	...	...	*Asterias*, sp. f.; *Solaster papposa*, r.; *Alcyonium*, f.; a very small	At beginning — Wind N.E., force 6; weather, dull, with snow showers; sea, rough; tide,
					Plaice,	2	14	1	13	10	11-12		
					,,	6	9	...	...	...	...		
					Lemon soles,	1	10	...	...	...	...		
					Common dabs,	1	10	5	8	7	7		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 10th March 1892. 2.10 p.m. to 3.40 p.m. —*continued.*	W. 38·0	37·8	38·6 14 fath.	Bottom Tow-net. — *Doris*, r.; *Boreophausia*, r.; *Parathemisto*, r.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; *Sagitta*, f.; small Ctenophora, r.	Common dabs,	11	5–6	...	...	...	...	quantity of weed.	; barometer, 29·48; transparency, 3 fathoms. At finish—Wind, weather, and sea, as before; tide, barometer, 29·55; transparency, 3 fathoms.
					Flounders,	2	13	1	10	1	9		
					Long rough dabs,	1	9	1	7	3	6		
					" "	4	5	...	...	...	...		
					Whiting,	1	5	...	...	...	...		
					Angler,	1	14	...	...	...	...		
					Cat-fish,	1	33	2	31	...	...		
STATION III. 11th March 1892. 11.17 a.m. to 1.25 p.m.	E. 36·0 W. 38·0	37·8 38·0	38·6 12½ fath. 38·6 13 fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Calanus finmarchicus*, r. Bottom Tow-net.—*Boreophausia*, sp. fr.; *Siriella armata*, r.; *Leptomysis lingvura*, r.; *Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Sagitta*, fr.; *Nerine*, sp. f.; small Ctenophora, f.	Thornback ray,	1	9	...	...	...	...	*Pecten opercularis*, fr.; *Mytilus modiolus*, sev.; *Buccinum undatum*, fr.; *Fusus antiquus*, f.; *Nephrops* fr.; *Asterias*, sp. f.; *Solaster papposa*, fr.; *Ophiothrix rosula*, c.; *Echinus esculentus*, f.; *Alcyonium*, fr.	At beginning — Wind N.E., force 4; weather, cloudy; sea, strong easterly swell; tide, 3½ hours flood; barometer, 29·68; transparency, 2½ fathoms. At finish—Wind, weather and sea, as before; tide, 5½ hours flood; barometer, 29·69; transparency, 2½ fathoms.
					Plaice,	1	14	2	13	2	12		
					Lemon soles,	1	14	5	10–12	3	8–9		
					" "	2	5 6	...	...	...	...		
					Common dabs,	3	8	3	7	2	5		
					Long rough dabs,	2	8	8	7	9	6		
					" "	6	5	...	...	...	...		
					Cod,	1	26	5	19–22	17	13–15		
					"	6	6	...	...	...	...		
					Whitings,	1	9	17	6	4	4		
					Cat-fish,	1	36	2	30–32	1	25		
					" "	1	14	...	...	...	...		
					Herring,	1	7	...	...	...	...		
STATION IV. 12th March 1892. 11.0 a.m. to 1.5 p.m.	E. 37·5	37·1	37·1 7 fath.	Surface Tow-net.—*Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Caligus rapax*, f.; *Sagitta*, f.	Plaice,	15	14	57	12	28	10	*Pecten opercularis*, fr.; *Buccinum undatum*, f.; *Asterias*, sp. f.;	At beginning—Wind N.E., force 4; weather, a little hazy; sea, moderate; tide, 2¼ hours flood; barometer, 29·59; trans-
					"	14	8–9	...	...	...	...		
					Common dabs,	1	10	4	9	3	8		
					" "	3	4	...	...	...	...		
					Cod,	1	6	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 12th March 1892. 11.0 a.m. to 1.5 p.m. —*continued.*	W. 36·0	37·2	37·0 5½ fath.	Bottom Tow-net.—*Boreophausia*, f.; *Mysis flexuosus*, r.; *Mysidopsis gibbosa*, r.; *Macropsis slabberi*, f.; *Parathemisto*, sp. fr.; *Calanus finmarchicus*, fr.; *Sagitta*, c.; larval Crustacea, fr.; larval fish.								*Chalina*, sp. fr.; some weed and Zoophytes.	parency, 1½ fathoms. At finish—Wind, and weather, as before; sea, moderate; tide, 4½ hours flood; barometer, 29·54; transparency, 1½ fathoms.
STATION V. 16th March 1892. 2.15 p.m. to 4.30 p.m.	E. 39·5 W. 41·0	39·0 39·0	30·0 23 fath. 39·1 28 fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Calanus finmarchicus*, r.; *Sagitta*, r.; small Ctenophora, r.; fish ova, several. Bottom Tow-net.—*Boreophauisa*, sp. f.; *Erythrops*, sp. f.; *Gastrosaccus spinifer*, r.; *Mysis ornatus*, several; *Calisoma crenata*, r.; *Atylus bispinosus*, f.; *Parathemisto*, sp. f.; *Tauria*, sp. r.; *Hyperia*, sp. r.; *Sagitta*, c.	Thornback rays,	1	16	2	13	2	9½	A large number of *Nephrops norvegicus*, and a few *Asterias* were the only invertebrates in the trawl net.	At beginning—Wind S.S.E., force 4; weather, hazy; sea, strong easterly swell; tide, 4 hours flood; barometer, 29·77; transparency, 3½ fathoms. At finish—Wind S.S.E., force 4; weather, hazy; sea, strong easterly swell; tide, high water; barometer, 29·75; transparency, 3¼ fathoms.
					Plaice,	2	6	4	14½	2	13		
					,,	1	9	...	...	...	...		
					Lemon soles,	3	13	1	10	...	...		
					Common dabs,	1	8	3	7	1	6		
					,, ,,	2	4	...	...	...	...		
					Witch soles,	1	19	1	18	2	13		
					Flounder,	1	14	...	...	...	...		
					Long rough dabs,	1	13	25	8–10	79	5–7		
					,, ,,	1	3½	...	...	...	...		
					Haddocks,	1	16	12	14½	4	11		
					,,	1	6	...	...	...	...		
					Cod,	1	39	2	29	2	24½		
					,,	4	22	4	18	2	13		
					,,	1	10	4	7	...	...		
					Whitings,	1	18	6	10–11	3	7–9		
					,,	25	5–6	...	...	...	...		
					Herrings,	1	10	2	9	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 16th March 1892. 12.30 p.m. to 1.20 p.m.	E. 40·0 W. 41·0	39·0 38·9	38·9 14 fath. 38·9 13 fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; small Ctenophora, r. Bottom Tow-net.—*Boreophausia*, f.; *Mysis ornatus*, r.; *Cumacea*, f.; *Parathemisto*, sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Sagitta*, fr.; small Ctenophora, f.; young fish, r.	Plaice,	1	19	3	16	1	15	A few *Asterias*; 1 *Solaster endeca*, and 2 small *Fusus* (*F. antiquus* and *F. gracilis*) were the only invertebrates in the trawl net.	At beginning—Wind S.S.E., force 3; weather, hazy; sea, strong easterly swell; tide, barometer, 29·78; transparency, 3 fathoms. At finish — Wind, weather, sea, as before; tide, barometer, transparency, 3 fathoms.
					,,	10	13	12	12	3	9		
					Lemon soles,	2	12	1	7	...	...		
					Common dab,	1	9	2	8	3	7		
					,, ,,	1	5	...	..	...	...		
					Long rough dab,	1	6	...	...	..	...		
					Cod,	2	21	1	19	1	17		
					,,	1	15	2	13	4	5–6		
					Whiting,	1	10	...	...	...	...		
					Cat-fish,	1	34	1	25	...	...		
STATION VII. 14th March 1892. 12.30 p.m. to 2.30 p.m.	E. 37·0 W. 39·0	38·1 38·0	38·1 18 fath. 37·7 10 fath.	Surface Tow-net.—*Parathemisto*, sp., r.; *Calanus finmarchicus*, r.; fish ova, r. Bottom Tow-net.—*Boreophausia*, sp. f.; *Mysis ornatus*, f.; *Mysis lamornæ*, f.; *Siriella*, sp. r.; *Parathemisto*, sp. fr.; *Tauria*, sp. r.; *Calanus finmarchicus*, f.; *Sagitta*, fr.; *Tomopteris*, f.	Thornback rays,	2	12	1	9	2	8	*Pecten opercularis*, f.; *Asterias*, sp. f.; some weed (large *Laminaria*).	At beginning — Wind W.N.W., force 2; weather, dull; sea, strong easterly sea; tide, ½ hour flood; barometer, 29·42; transparency, 2¼ fathoms. At finish—Wind variable, light; weather, sea, as before; tide, 5 hours flood; barometer, 29·41; transparency, 2 fathoms.
					Plaice,	2	16½	12	12–14	11	10½		
					,,	3	7	...	...	...	...		
					Lemon soles,	1	11	1	10	...	...		
					Common dabs,	1	13	9	9–11	15	6–8		
					,, ,,	1	4	...	...	...	...		
					Flounder,	1	18	...	...	...	...		
					Long rough dabs,	1	10	1	8	6	7		
					,, ,,	5	6	...	...	...	...		
					Haddocks,	1	12	1	11	...	...		
					Cod,	2	16	6	15	3	12		
					,,	1	5	...	...	...	...		
					Whitings,	5	5	...	...	...	...		
					Pogge,	1	5	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VIII. 15th March 1892. 3.0 p.m. to 4.40 p.m.	N.E. 39·7 S.W. 38·7	39·0 38·7	39·5 29 fath. 39·0 22½ fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Calanus finmarchicus*, r.; *Sagitta*, r.; fish ova, f. Bottom Tow-net.—*Boreophausia*, sp. f.; *Mysis*, sp. f.; *Erythrops*, sp. r.; *Diastylis*, sp.; and other Cumaca, f.; *Parathemisto*, sp. f.; *Atylus bispinosus*, r.; *Monoculodes longimanus*, f.; *Melphidda*, sp. r.; *Calanus finmarchicus*, fr.; *Sagitti*, c.; *Tomopteris*, f.; small Ctenophora, f.	Grey skate, .	1	19	...	...	...	...	*Fusus antiquus*, r.; *Nephrops norvegicus*, r.; *Asterias*, sp. f.; *Alcyonium*, sp. fr.; *Actinoloba dianthus*, f.	At beginning — Wind S.E., force 3; weather, hazy; sea, strong easterly swell; tide, 4¾ hours flood; barometer, 29·35; transparency, 3 fathoms. At finish—Wind E., force 4; weather, overcast; sea, as before; tide, 7 hours ebb; barometer, 29·35; transparency, 3 fathoms.
					Plaice, . .	1	6	...	...	...	...		
					Lemon soles, .	1	13	1	13	...	...		
					Common dabs, .	6	8½	5	7	2	5		
					,, ,, .	1	4	...	...	...	...		
					Witch soles, .	2	18	...	...	...	...		
					Flounder, . .	1	13	...	...	...	...		
					Long rough dabs,	3	8	3	7	7	6		
					Haddocks, . .	3	14½	19	12½	12	10		
					,, . .	4	8–9	...	...	...	...		
					Cod, . . .	2	33	3	31	3	29		
					,, . . .	5	23	3	20	3	8		
					Whitings, . .	1	18	1	15	1	14		
					,, . .	1	12	...	...	...	...		
					Herring, . .	1	9	...	...	...	...		
					Dragonet, . .	1	5	...	...	...	...		
STATION IX. 15th March 1892. 12.55 p.m. to 2.40 p.m.	S. E. 39·0 N.W. 39·8	40·0 39·5	40·0 32 fath. 39·8 29½ fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Calanus finmarchicus*, r.; *Sagitta*, r.; fish ova, ab. Bottom Tow-net.—*Boreophausia*, sp. r.; *Parathemisto*, sp. r. *Caligus rapax*, r.; *Sagitta*, c.; larval Crustacea, f.	Plaice, . .	2	13	...	...	...	...	A few *Asterias* and 1 *Solaster papposa*, were all the invertebrates in the trawl net.	At beginning — Wind E., force 1; weather, a little hazy; sea, strong easterly swell; tide, 2¾ hours flood; barometer, 29·37; transparency, 8 fathoms. At finish—Wind S.E., force 3;
					Common dabs, .	2	12½	2	11	6	7½		
					,, ,, .	9	5–6	...	...	...	...		
					Witch soles, .	1	16	...	...	...	...		
					Flounder, . .	1	11	...	...	...	...		
					Long rough dabs,	2	8	7	7	30	5–6		
					,, ,, .	2	3½	...	...	...	...		
					Haddocks, .	1	15	2	13	...	...		
					Cod, . . .	1	21	1	11	...	...		
					Whitings, . .	1	11	6	6	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl own.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IX. 15th March 1892. 12.55 p.m. to 2.40 p.m. —*continued.*					Anglers,	1	3	1	28	...	...		weather, cloudy; sea, as before; tide, 4½ hours flood; barometer, 29·36; transparency, 4½ fathoms.
					Herring,	1	9½	...	...	...	...		
					Dragonet,	1	8	1	6	...	...		
STATION X. 1st March 1892. 11.25 a.m. to 12.15 p.m.	E. 39·0	37·8	37·5 7 fath.	Surface Tow-net.—One or two larval Crustacea, and some Infusoria, otherwise *nil*. Bottom Tow-net. — A quantity of vegetable debris, but scarcely anything else.	Gray skates,	1	12	1	6	...	...	*Hyas araneus*, fr.; *Carcinus mœnus*, f.; *Echinus miliaris*, f.; a considerable quantity of hardened mud consisting of *Sabellæ* tubes.	At beginning — Wind E., force 4; weather, overcast; sea, moderate; tide, 1 hour flood; barometer, 30·13; transparency, ⅔ fathom. At finish—Wind E., force 5; weather, sea, as before; tide, 1¾ hours flood; barometer, 30·15; transparency, ½ fathom.
					Thornback rays,	2	9	1	7	2	6		
					,, ,,	6	5	...	...	...	...		
					Plaice,	2	12	1	10	2	9		
	W. 38·5	37·6	37·0 7½ fath.		,,	1	8	...	...	...	...		
					Long rough dabs,	2	7	2	6	...	...		
					Cod,	1	19½	3	17	1	15		
					,,	3	13	...	...	...	...		
					Whitings,	2	6	5	5	3	4		
					Pogge,	2	6	7	4–5	...	...		
					Liparis,	1	4	...	...	...	...		
STATION I. 26th April 1892. 2.55 p.m. to 5.0 p.m.	E. 50·0	43·0	41·7 18 fath.	Surface Tow-net. — *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Acartia longiremis*, fr.; *Centropages*, sp. fr.; *Evadne*, sp. f.; larval Crustacea, f.; fish ova, fr.	Thornback rays,	1	11	2	9	...	...	*Pecten opercularis*, f.; *Mytilus modiolus*, f.; *Buccinum undatum*, r.; *Fusus antiquus*, r.; *Asterias*, sp.	At beginning — Wind, variable, light; weather, cloudy, fine; sea, smooth; tide, ¾ hour ebb; barometer, 29·82;
					Plaice,	2	15	13	13	14	12		
					,,	5	8-9	...	...	...	...		
					Lemon soles,	2	13	10	12	9	10		
					,,	9	7	...	...	...	...		
					Common dabs,	3	8	10	7	5	6		
					,, ,,	2	4½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air. Dry Bulb.	Water. Surface.	Water. Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 26th April 1892. 2.55 p.m. to 5.0 p.m. —*continued.*	W. 48·0	43·5	42·0 13 fath.	Bottom Tow-net. — *Parathemisto* (juv.), r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; other Copepoda, f.; *Sagitta*, fr.; larval Crustacea, fr.; young fish, r.	Flounders,	3	10	2	9	1	7	f.; *Ophiothrix rosula*, f.; *Solaster endeca*, r.; *Echinus esculentus*, fr.; *Alcyonium*, sp. f.	transparency, 4 fathoms. At finish—Wind E., force 1; weather, sea, as before; tide, 2¾ hours ebb; barometer, 29·89; transparency, 3½ fathoms.
					Long rough dabs,	1	9	3	7	...	...		
					Haddocks,	2	12	...	...	...	...		
					Cod,	2	22	1	20	3	14		
					,,	3	5–8	...	...	...	...		
					Whiting,	1	4	...	...	...	...		
					Gurnards,	3	13	3	11	1	9		
					,,	1	8	...	...	...	...		
					Anglers,	1	30	1	24	1	18		
					,,	2	13	...	...	...	...		
					Cat-fish,	1	33	2	29	3	23		
STATION II. 21st April 1892. 1.37 p.m. to 3.0 p.m.	W. 40·9	42·1	48·9 13½ fath.	Surface Tow-net. — *Calanus finmarchicus*, f.; *Temora longicornis*, fr.; fish ova, f. (net damaged). Bottom Tow-net. — *Boreophausia*, r.; *Pseudocuma*, sp. v.r.; *Calanus finmarchicus*, f.; *Temora longicornis*, c.; *Balani* (larval), fr.; other young Crustacea, f.; young fish, r.	Plaice,	2	16½	11	13–14	20	11–12	*Octopus vulgaris* (juv.), 1; *Fusus* (small), r.; *Nephrops norvegicus*, r.; *Asterias*, sp. f.; *Solaster papposa*, f.; *Ascidians*, fr.; *Alcyonium*, sp. f.	At beginning — Wind W.N.W., force 4; weather, hazy; sea, moderate; tide, ; barometer, 29·92; transparency, 3 fathoms. At finish—Wind, weather, sea as before; tide, ; barometer, 29·93; transparency, 2⅝ fathoms.
					,,	7	8–9	...	...	...	...		
					Lemon soles,	1	10	1	8	...	...		
					Common dabs,	8	8	10	7	5	6		
	E. 49·0	42·1	41·0 13 fath.		,, ,,	7	4–5	...	...	...	...		
					Flounders,	2	14	3	11 12	4	8-9		
					,,	3	6–7	...	.	...	...		
					Long rough dabs,	4	6	1	5	...	...		
					Haddocks,	2	12	3	11	...	...		
					Cod,	1	14	...	...	...	...		
					Whiting,	1	8	...	...	...	...		
					Gurnards,	2	12–13	3	9–10	3	8		
					,,	3	6	...	...	...	...		
					Cat-fish,	1	24	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Tim Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station III. 25th April 1892. 2.0 p.m. to 4.45 p.m.	E. 48·0	43·3	41·6 14 fath.	Surface Tow-net. — *Boreophausia*, sp. f.; *Calanus finmarchicus*, fr.; *Acartia longiremis*, fr.; *Temora longicornis*, f.; *Centropages*, sp. fr.; *Evadne*, f.; *Sagitta*, f.; small Ctenophora, c.; larval *Balani*, fr.; other larval Crustacea, f.; fish ova, fr.	Plaice,	2	14	4	13	4	11	*Pecten opercularis*, f.; *Mytilus modiolus*, f.; *Nephrops norvegicus*, r.; *Eupagurus*, sp. f.; *Asterias*, sp. fr.; *Solaster papposus*, fr.; *Echinus esculentus*, r.; *Actinoloba dianthus*, fr.; Zoophytes, f.; *Alcyonium*, f.	At beginning — Wind N.W., force 2; weather, cloudy; sea, slight; tide, ½ hour ebb; barometer, 29·75; transparency, 3½ fathoms. At finish—Wind E.S.E., force 3; weather, dull, showery; sea, slight; tide, 3½ hours ebb; barometer, 29·77; transparency, 4 fathoms.
					,,	2	7–9	...	...	...	...		
					Lemon soles,	1	16	8	13	7	9–10		
					,, ,,	11	7–8	...	...	...	...		
					Common dabs,	5	9	6	8	14	7		
					,, ,,	14	5–6	...	...	...	...		
					Flounders.	1	10	2	9	2	8		
					Long rough dabs,	1	12	2	19	27	6–8		
					,, ,,	17	4·5	...	...	...	...		
					Cod,	1	24	2	21	3	15–16		
	W. 45·0	42·9	41·7 12 fath.	Bottom Tow-net. — *Siriella*, sp. r.; *Boreophausia*, sp. f.; *Atylus bispinosus*, r.; *Stenothoe* sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Caligus rapax*, r.; larval *Balani*, ab.; larval and post-larval fish, few.	,,	5	6–9	...	...	...	...		
					Whitings,	18	6	...	...	...	...		
					Ling,	1	16	...	...	...	...		
					Gurnards,	1	12	2	10	1	8		
					,,	10	6	...	...	...	...		
					Anglers,	1	28	3	20	2	18		
					Cat-fish,	1	32	...	...	...	...		
Station IV. 25th April 1892. 10.30 a.m. to 1.35 p.m.	W. 48·0	42·3	43·1 5½ fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Sagitta*, f.; fishes, larval and post-larval, 2; larval *Balani*, fr.; other larval Crustacea, fr.; fish ova, fr.	Thornback ray,	1	25½	...	...	...	...	*Mytilus modiolus*, r.; *Pecten opercularis*, c.; *Asterias*, r.; *Solaster papposa*, r.; *Echinus esculentus*, r.; *Aphrodite*, 1;	At beginning — Wind N.W., force 3; weather, a little hazy; sea, slight; tide, 3 hours flood; barometer, 29·77; transparency, 2½ fathoms.
					Plaice,	2	15	15	13–14	27	12		
					,,	45	9–10	...	...	...	...		
					Lemon soles,	1	14	1	13	1	12		
					,, ,,	2	11	...	...	...	...		
					Common dabs,	1	12	2	11	2	10		
					,, ,,	8	8–9	...	...	...	...		
					Flounder,	1	8½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind Weather, and other Observations.
	Air.	Water.				...							
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 25th April 1892. 10.30 a.m. to 1.35 p.m. —*continued.*	E. 48·0	44·1	43·0 8½ fath.	Bottom Tow-net.—*Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Sagitta*, f.; young Lamellibranchs, f.; young *Balani*, fr.; other young Crustacea, fr.; fish, larval and post-larval, fr.	Cod,	1	22	1	21	...	...	*Alcyonium*, f.; Sponges, f.; Zoophytes, f.	At finish—Wind W.N.W., force 2; weather, showery; sea, slight; tide, high water; barometer, 29·76; transparency, 3 fathoms.
					Gurnards,	1	13	5	11–12	1	10		
					,,	2	6–7	...	...	...	...		
					Anglers,	1	30	...	...	...	...		
					Cat-fish,	1	34	...	...	...	...		
STATION V. 2nd May 1892. 10.25 a.m. to 12.35 p.m.	W. 49·0	44·0	42·0 27½ fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Calanus finmarchicus*, f.; *Acartia longiremis*, f.; *Centropages*, sp. f.; *Evadne nordmanni*, f.; young *Balani*, f.; fish ova, fr.	Plaice,	1	13	1	12	1	7		At beginning — Wind E., force 3; weather, hazy; sea, slight, east; tide, 4 hours ebb; barometer, 29·96; transparency, 5 fathoms.
					Common dabs,	2	6½	2	5	...	...		
					Lemon soles,	1	14	1	9½	...	...		
					Long rough dabs,	1	20	4	9	4	8		
					,, ,,	27	6½	29	5	8	4		
	E. 49·0	43·8	41·9 24 fath.		Haddocks,	2	15	1	12	2	11		
					Cod,	1	27	2	24	1	21		
				Bottom Tow-net. — *Boreophausia*, sp. f.; *Leucon*, sp. r.; *Parathemisto*, sp. r.; *Erythrops goesii*, r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Sagitta*, fr.; young Crustacea, fr.	,,	1	18	2	15	1	6½		
					Long flounders,	1	19	1	14½	...	...		At finish—Wind N.E., force 4; weather, hazy; sea, smooth; tide, about low water; barometer, 29·97; transparency, 5½ fathoms.
					Whitings,	1	11	2	9	4	7		
					,,	25	6	4	4½	...	...		
					Gurnards,	1	13	2	12	2	11		
						13	9	6	8	12	6		
STATION VI. 26th April 1892. 12.30 p.m. to 1.25 p.m.	E. 45·5	43·1	41·9 14½ fath.	Surface Tow-net. — *Parathemisto*, sp. r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Centropages*, sp. f.; *Evadne*, sp. f.; larval Crustacea, c.; young flat-fish, 1; fish ova, f.	Plaice,	3	15	9	14	6	13	*Fusus antiquus*, 1; *Fusus gracilis*, 1; *Portunus*, sp. r.; *Asterias*, sp. fr.; *Solaster endeca*,	At beginning — Wind S.S.W., force 1; weather, cloudy; sea, slight; tide, 4½ hours flood; barometer, 29·83;
					,,	6	11	...	...	...	...		
					Lemon soles,	2	13½	1	10	...	...		
					Common dabs,	1	9½	2	6	2	5		
					Flounder,	1	7½	...	...	...	...		
					Turbot,	1	19½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 26th April 1892. 12.30 p.m to 1.25 p.m. —*continued.*	W. 46·0	42·0	41·5 13 fath.	Bottom Tow-net. — *Parathemisto*, sp. r.; *Atylus*, sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Centropages*, sp. f.; *Sagitta*, fr.; larval *Balani*, and other Crustacea, c.; young fish, f.	Haddock, . .	1	11	...	...	...	...	r.; *Echinus esculentus*, r.; *Alcyonium*, r.; weed, r.	transparency, 5 fathoms. At finish—Wind, weather, sea as before; tide, 5½ hours flood; barometer, 29·83; transparency, 4¾ fathoms.
					Cod, . . .	1	28	1	26	1	24		
					,, . . .	1	21	...	...	...	...		
					Angler, . .	1	21	...	...	...	...		
STATION VII. 2nd May 1892. 2.5 p.m. to 3.50 p.m.	E. 50·0	44·6	43·0 16 fath.	Surface Tow-net. — *Parathemisto oblivia*, r.; *Calanus finmarchicus*, r.; *Centropages*, sp. r.; young *Balani*, sp. f.; fish ova, f.	Thornback rays, .	1	26	1	24	...	...		At beginning — Wind E.N.E., force 3; weather, a little hazy; sea, smooth; tide, first ¼ hour flood; barometer, 29·97; transparency, 3½ fathoms. At finish—Wind E.N.E., force 3; weather, clear; sea, smooth; tide, about ½ hour flood; barometer, 29·99; transparency, 3 fathoms.
					Plaice, . .	1	15	1	14	3	13		
					,, . .	2	12	1	11	1	9		
					,, . .	3	8	1	7	...	...		
				Bottom Tow-net. — *Parathemisto*, sp. f.; *Calanus finmarchicus*, f.; *Pseudocalanus elongatus*, r.; *Temora longicornis*, f.; *Metridia armata*, f.; *Centropages*, sp. f.; *Caligus rapax*, r.; *Evadne nordmanni*, f.; *Sagitta*, sp. fr.; *Tomopteris*, sp. r.; larval and young Crustacea, fr.; young lamellibranchs, f.; young Ophiuridæ, f.; post-larval fish, r.; fish ova, f.	Lemon soles, .	1	13	1	11	2	9		
					,, ,, .	2	8	2	7	...	...		
					Common dabs, .	1	9	4	8	9	7		
	W. 52·0	45·0	43·7 9 fath.		,, ,, .	16	6	18	5	9	4		
					,, ,, .	1	3	...	...	...	...		
					Long rough dabs,	2	8	...	...	...	...		
					Haddock, . .	1	11	...	...	...	...		
					Whitings, . .	2	6	...	...	...	...		
					Gurnards, . .	4	11	19	10	55	8		
					,, . .	29	7	14	6	3	4½		
					Angler, . .	1	30	...	...	...	...		
STATION VIII. 9th May 1892. 11.0 a.m. to 1.0 p.m.	S.W. 55·0	44·9	43·0 22 fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; *Acartia longiremis*, r.; *Temora longicornis*, r.; *Centropages*, sp. r.; *Evadne nordmanni*, r.; *Sagitta*, sp.	Grey skates, .	1	17	1	12	...	...		At beginning — Wind E., force 1; weather, hazy; sea, slight easterly swell; tide, nearly 4 hours flood; barometer,
					Starry rays, .	1	12	1	10	...	...		
					Plaice, .	1	15	1	9	...	...		
					Common dabs, .	3	8	2	7	2	6		
					,, ,, .	2	5	1	4	...	...		
					Long rough dabs,	4	8	9	7	17	6		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Traw down.	Temperature			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VIII. 9th May 1892. 11.0 a.m. to 1.0 p.m. —*continued.*	N.E. 50·0	44·8	42·0 29 fath.	r.; larval *Balani*, f.; fish ova, fr. Bottom Tow-net.—*Boreophausia*, sp. r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, fr.; *Sagitta*, sp. c.; *Tomopteris*, sp. f.; young and larval Crustacea, c.; fish ova, fr.	Long rough dabs,	5	5	...	...	...	...		30·10; transparency, 5½ fathoms. At finish—Wind S.E., force 2; weather, hazy; sea, slight easterly swell; tide, nearly high water, barometer, 30·11; transparency, 6 fathoms.
					Witch soles,	1	13	...	...	...	...		
					Haddocks,	1	14	1	12	2	11		
					,,	1	10	...	...	...	...		
					Cod,	1	23	...	...	...	...		
					Whitings,	1	13	1	10	2	8		
					,,	1	7	15	6	1	4		
					Hake,	1	5	...	...	...	...		
					Gurnards,	1	13	1	12	4	11		
					,,	4	10	16	8	15	7		
					,,	7	5½	...	...	...	...		
					Angler,	1	29	1	24	1	22		
					Dragonet,	1	8	...	...	...	...		
STATION IX. 6th May 1892. 2.30 p.m. to 4.10 p.m.	N.W. 46·0	43·5	41·9 30 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Acartia longiremis*, f.; *Centropages*, sp. f.; young Crustacea, f.; fish ova, fr.	Long rough dabs,	4	7	5	6	2	5	*	At beginning—Wind S., force 4; weather, clear; sea, heavy easterly swell; tide, nearly ½ hour ebb; barometer, 30·19; transparency, 6½ fathoms. At finish—Wind S., force 4; weather, clear; sea, heavy easterly swell; tide, ¾ hours ebb; barometer, 30·17; transparency, 7 fathoms.
					,, ,,	2	4	...	...	...	...		
					Whitings,	2	8	3	7	2	6		
					Three-bearded rockling,	1	8	...	...	...	...		
	S. E. 43·0	43·0	42·1 33 fath.	Bottom Tow-net.—*Boreophausia*, sp. r.; *Erythrops goesii*, f.; *Diastylis*, sp. f.; *Calanus finmarchicus*, ab.; *Temora longicornis*, f.; *Metridia armata*, f.; *Parathemisto*, sp. f.; *Sagitta*, c.; young Crustacea, c.									

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* Trawl working well, but a very heavy sea was running.

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION X. 12th April 1892. 3.5 p.m. to 4.0 p.m.	W. 41·0	42·0	41·9 9 fath.	Surface Tow-net.—*Mysis*, sp. r.; *Acartia longiremis*, fr.; *Temora longicornis*, f.; a quantity of mud in suspension in the water. Bottom Tow-net.—*Pandalus annulicornis*, f.; *Crangon vulgaris*, f.; *Mysis inermis*, fr.; *Mysis spiritus*, f.; *Macropsis slabberi*, f.; *Diastylis*, sp. f.; *Calanus finmarchicus*, f.; *Acartia longiremis*, f.	Thornback ray,	1	9½	...	...	...	...	*Hyas araneus*, r.; *Portunus holsatus*, r.; *Eupagurus bernhardus*, several; *Pandalus annulicornis*, several; *Asterias*, r.; *Echinus miliarus*, r.	At beginning—Wind S.E., force 2; weather, dull; sea, smooth; tide, high water; barometer, 29·91; transparency, ⅔ fathoms. At finish — Wind calm, weather and sea as before; tide, 1 hour ebb; barometer, 29·90; transparency, ½ fathom.
					Plaice,	1	9	...	...	...	...		
					Long rough dabs,	1	7	...	...	...	...		
					Cod,	1	18	1	15	1	14		
					Whitings,	2	7	2	5	...	...		
					Pogge,	1	5	...	...	...	...		
	E. 41·0	41·9	41·8 8 fath.					...		..	.		
STATION I. 17th May 1892. 10.20 a.m. to 12.35 p.m.	W. 49·0	45·2	45·0 11½ fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Evadne*, sp. fr.; larval Crustacea, c.; fish ova, f. Bottom Tow-net.—*Calanus finmarchicus*, fr.; *Temora longicornis*, fr.; *Caligus rapax*, r.; *Evadne*, f; *Sagitta*, fr.; *Nerine*, r.; larval Crustacea, f.; post-larval fish, f.	Thornback rays,	1	22	1	17	...	...	*Pecten opercularis*, f.; *Mytilus modiolus*, several; *Buccinum undatum*, r.; *Asterias*, c.; *Solaster papposa*, r.; *Ophiothrix rosula*, f.; *Echinus esculentus*, r.; *Chalina*, *Actinoloba*, weed, f.	At beginning — Wind S.E., force 1; weather, cloudy; sea, smooth; tide, 4¾ hours ebb; barometer, 29·87; transparency, 3½ fathoms. At finish—Wind E., force 3; weather, cloudy; sea, slight; tide, 1 hour flood; barometer, 29·90; transparency, 3½ fathoms.
					Plaice,	1	16	2	13	16	12		
					,,	14	9-10	...	...	...	...		
					Lemon soles,	2	14	5	12	17	10½		
					,, ,,	22	6½–8½	...	...	...	...		
	E. 48·7	46·0	44·8 14½ fath.		Common dabs,	3	9	3	8	25	6–7		
					,, ,,	11	4–5	...	...	...	...		
					Flounder,	1	7	...	...	...	...		
					Long rough dabs,	1	8	4	7	6	6		
					,, ,,	1	5	...	...	...	...		
					Haddocks,	1	12	1	13	...	...		
					Cod,	1	24	1	14	1	9		
					,,	1	7	...	...	...	...		
					Whitings,	2	7	...	...	..	...		
					Gurnards,	1	15	15	11–12	46	8–9½		
					,,	29	6–7	...	...	...	...		
					Anglers,	1	28	1	27	1	24		
					,,	3	18–20	...	...	...	...		
					Cat-fish,	1	32	1	29	1	27		
					Dragonet,	1	7	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station II. 19th May 1892. 10.50 a.m. to 12.30 p.m.	W. 46·4	44·9	45·3 13½ fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Acartia*, sp. f.; *Temora longicornis*, fr.; *Centropages*, sp. f.; *Sagitta*, r.; larval Crustacea, fr.	Plaice,	9	14–15	15	11–12	16	9–10	*Buccinum undatum*, r.; *Ascidians*, c.; *Asterias*, c.; *Solaster endeca*, f.; *Ophiothrix rosula*, fr.; *Alcyonium*, Sponge, Zoophytes, weed, fr.	At beginning — Wind W.N.W., force 6; weather, a little cloudy; sea, rough; tide, 3¼ hours ebb; barometer, 29·80; transparency, 4 fathoms. At finish—Wind, weather, sea, as before; tide, 5 hours ebb; barometer, 29·84; transparency, 5½ fathoms.
					,,	1	7	...	...	...	...		
					Lemon soles,	1	11	2	9	3	8		
					,, ,,	4	7	...	...	...	...		
					Common dabs,	7	7	8	6	20	5		
					Long rough dabs,	3	10–11	13	8–9	3	6-7		
	E. 53·0	45·5	44·3 15½ fath.	Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Pseudocalanus*, f.; *Evadne*, sp. f.; *Sagitta*, f.; larval Crustacea, f.	,, ,,	1	5	...	...	...	...		
					Gurnards,	2	11	3	8	12	7		
					,,	70	5–6	...	...	...	...		
					Cat-fish,	1	37	...	...	...	...		
					Dragonet,	2	8	1	7	1	6		
					Pogge,	1	4½	...	...	...	...		
Station III. 20th May 1892. 2.23 p.m. to 4.35 p.m.	E. 50·0	47·5	46·5 13 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Centropages*, sp. f.; *Evadne*, f.; small Medusidæ, fr.; larval Crustacea, fr.	Plaice,	1	12	1	13	5	11	*Buccinum undatum*, r.; *Fusus antiquus*, r.; *Asterias*, fr.; *Solaster papposa*, r.; *S. endeca*, fr.; *Echinus esculentus*, r.; *Actinoloba, dianthus*, fr.; *Alcyonium*, f.	At beginning — Wind N.E., force 5, squally; weather, showery; sea, moderate; tide, 5¼ hours ebb; barometer, 29·72; transparency, 3½ fathoms. At finish—Wind N.E., force 5; weather, dull; sea, rough; tide, 1½ hour flood; barometer, 29·80; transparency, 5 fathoms.
					,,	4	8–9	...	...	...	...		
					Lemon soles,	4	12	20	9	14	7½		
					Common dabs,	5	9	9	8	30	6½		
					,, ,,	12	5	...	...	...	...		
					Flounder,	1	7	...	...	...	...		
				Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Appendicularia*, fr.; *Sagitta*, fr.; small Medusidæ, fr.	Long rough dabs,	7	9	10	8	8	6		
	W. 47·0	46·0	44·0 13 fath.		Cod,	1	15	3	7	1	6		
					Whitings,	1	11	3	8	4	5		
					Gurnards,	1	14	4	10–11	83	8		
					,,	50	4–6½	...	...	...	...		
					Anglers,	2	19	1	17	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.[*]						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 21st May 1892. 10.15 a.m. to 12.15 p.m.	W. 46·8	47·5	47·3 7 fath.	Surface Tow-net.—*Idotea marina*, r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, fr.; *Acartia*, sp. fr.; larval Crustacea, fr. Bottom Tow-net.—*Temora longicornis*, fr.; *Acartia*, sp. fr.; *Calanus finmarchicus*, r.; *Caligus rapax*, r.; *Evadne*, f.; larval *Balani*, f.; young *Crangon*, r.	Thornback rays, .	1	25	1	24	3	20	*Pecten opercularis*, c.; *Mytilus modiolus*, fr.; *Hyas araneus*, r.; *Portunus holsatus*, f.; *Eupagurus bernhardus*, fr.; *Asterias*, fr.; *Solaster papposa*, fr.; *Echinus esculentus*, f.; *Chalina*, *Flustra*, fr.	At beginning — Wind W.S.W., force 4; weather, hazy; sea, moderate; tide, high water; barometer, 29·86; transparency, 2½ fathoms. At finish—Wind W., force 5; weather, dull; sea, moderate; tide, 2 hours ebb; barometer, 29·81; transparency, 3 fathoms.
					,, ,, .	3	17	...	...	...	...		
					Plaice, . .	12	13	17	12	90	9–10		
					,, . .	15	7	...	...	...	...		
					Lemon soles, .	1	11	2	9	...	...		
	E. 50·8	47·5	47·3 7 fath.		Common dabs, .	2	10–11	14	8–9	13	5–6		
					Long rough dabs,	3	9	3	8	1	7		
					Cod, . . .	1	35	1	27	3	18–21		
					,, . . .	3	15–17	...	...	...	...		
					Whiting, . .	1	5	...	...	...	...		
					Gurnards, . .	2	13–14	17	12	9	9–10		
					,, . .	12	5–7	...	...	...	...		
					Anglers, . .	2	15	...	...	...	...		
					Sprats, . .	2	4	...	...	...	...		
					Lampsucker, .	1	15	...	...	...	...		
STATION V. 18th May 1892. 10.27 a.m. 12.50 p.m.	W. 45·0	45·0	43·3 28 fath.	Surface Tow-net.—*Calanus finmarchicus*, c.; *Temora longicornis*, f.; *Centropages*, sp. f.; *Anomalocera patersonni*, r.; small Medusidæ, f.; larval and young Crustacea, fr.; fish ova, f. Bottom Tow-net.—*Calanus finmarchicus*, fr.; *Temora longicornis*, fr.;	Plaice, . .	7	15–16	2	13	1	11	*Asterias*, sp. fr.; *Sabella* (large).	At beginning—Wind S.E., force 3; weather, rain; sea, strong easterly sea; tide, 4 hours ebb; barometer, 29·83; transparency, 5 fathoms. At finish—Wind S.E., force 5; weather, rain; sea,
					,, . . .	1	8	...	...	...	...		
					Lemon soles, .	1	13	3	11–12	3	9		
					,, ,, .	3	7–8	...	...	...	...		
					Commom dabs, .	1	9	1	8	1	7		
					Witch soles, .	1	19	1	18	1	17		
					,, ,, .	1	16	...	...	...	...		
					Long rough dabs,	1	8	3	7	11	6		
	E. 45·3	44·8	43·0 22 fath.		Haddocks, . .	1	17	1	16	3	12		
					,, . .	4	10–11	...	...	...	...		
					Whitings, .	1	11	1	9	1	7		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulbs.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION V. 18th May 1892. 10.27 a.m. to 12.50 p.m. —*continued.*				*Evadne*, f.; *Sagitta*, fr.; post-larval fish, f.	Whiting,	1	6	...	...	...	...		strong, south easterly swell; tide, ¼ hour flood; barometer, 29·73; transparency, 5½ fathoms.
					Bib,	1	8	...	...	...	...		
					Gurnards,	1	10	1	8	1	7		
					,,	2	6	...	...	...	...		
					Anglers,	1	24	1	22	...	...		
STATION VI. 20th May 1892. 10.35 a.m. to 11.35 a.m.	W. 48·0	44·9	44·0 13 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; small Medusidæ, and larval Crustacea, f.	Plaice,	1	27	2	21–24	7	15–16	*Fusus antiquus*, r.; *Asterias*, f.; *Solaster papposa*, *S. endeca*, fr.; *Spatangus purpureus*, r.; *Cucumaria* (elongate, white), 2 sp.	At beginning—Wind W., squally; weather, showery; sea, moderate; tide, 1¾ hour ebb; barometer, 28·58; transparency, 7 fathoms. At finish — Wind, weather, sea, as before; tide, 2¾ ebb; barometer, 29·59; transparency, 7 fathoms.
					,,	14	12–14	...	...	...	...		
					Lemon soles,	4	14	4	13	5	12		
					,, ,,	3	10	...	...	...	...		
					Common dabs,	2	8	1	7	2	6		
	E. 48·5	44·9	43·9 15 fath.	Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Appendicularia*, c.; *Sagitta*, f.; small Medusidæ, ab.; post-larval fish, r.	Turbot,	1	22	...	...	...	...		
					Cod,	1	23	1	16	...	...		
					Gurnards,	1	15	1	13	1	12		
					Angler,	2	40–42	3	34–37	3	26–30		
					,,	3	19	...	...	...	...		
STATION VII. 18th May 1892. 2.0 p.m. to 3.35 p.m.	E. 49·5	46·1	44·1 17 fath.	Surface Tow-net. — *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Eolis*, sp. v. r.; *Caligus rapax*, r.; *Evadne*, f.; larval Crustacea, f.; fish ova, r.	Plaice,	1	22	4	15–16	20	12–13	*Eupagurus bernhardus*, r.; *Asterias*, fr.; *Solaster papposa*, *S. endeca*, r.; *Alcyonium*, f.	At beginning—Wind W.; force 5; weather, rain; sea, strong easterly swell; tide, 1½ hour flood; barometer, 29·71; transparency, 5 fathoms. At finish—Wind W., force 4; weather, dull, showery; sea, moderate; tide, 3 hours flood; barometer, 29·70; transparency, 4½ fathoms.
					,,	20	9–11	...	...	...	...		
					Lemon soles,	1	12	1	6½	...	...		
					Common dabs,	20	8–9	1	10	41	6-7		
					,, ,,	51	4–5	...	...	...	...		
				Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Caligus*, r.; *Sagitta*, f.; *Nerine*, r.; *Apendicularia*, several; young and larval Crustacea, fr.; larval Annelide, f.; young star-fish, fr.; post-larval fish, several.	Long rough dabs,	2	9	5	7	3	6		
	W. 49·0	47·0	45·0 10 fath.		Haddocks,	2	14	2	10	...	...		
					Whitings,	1	8	1	6	3	5		
					Gurnards,	1	14	4	11–12	120	8–9½		
					,,	15	5–6	...	...	...	..		
					Dragonets,	5	·8½	2	7	1	6		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station. Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate, Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VIII. 25th May 1892. 12.35 p.m. to 2.18 p.m.	S.W. 50·5	45·3	44·3 20 fath.	Surface Tow-net. — *Parathemisto*, r.; *Calanus finmarchicus*, c.; *Temora longicornis*, fr.; *Pseudocalanus elongatus*, f.; *Centropages* sp. f.; *Anomalocera patersonni*, r.; *Sagitta*, f.; young Crustacea, c.; fish ova, f.	Flounder,	1	8	...	...	...	...		At beginning—Wind S.E., force 4; weather, hazy; sea, moderate; tide, 5¼ flood; barometer, 29·61; transparency, 9 fathoms.
					Long rough dabs,	1	7	3	6	...	...		
					Haddock,	1	10	...	...	...	...		
					Whiting,	1	6	...	...	...	...		
					Gurnards,	1	12	1	11	...	...		
	N.E. 49·0	45·3	43·0 29 fath.	Bottom Tow-net. — *Monoculodes longimanus*, r.; *Temora longicornis*, f.; *Sagitta*, f.; *Appendicularia*, fr.; post-larval fish, r.									At finish — Wind S.E., force 4; weather, heavy rain; sea, moderate; tide, 1 hour ebb; barometer, 29·60; transparency, 8½ fathoms.
STATION IX. 25th May 1892. 2.35 p.m. to 4.45 p.m.	N.W. 49·0	45·3	43·0 30 fath.	Surface Tow-net. — *Parathemisto*, r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Acartia*, sp. f.; *Centropages*, sp. f.; *Anomalocera patersonni*, r.; young Crustacea, fr.; fish ova, f.	Plaice,	1	20	...	...	...	...	*Nephrops norvegicus*, r.; *Asterias*, fr.; *Astropecten, irregularts*, r.; *Alcyonium*, sp. r.	At beginning—Wind S.E., force 4; weather, heavy rain, thunder; sea, rough; tide, 1¼ hour ebb; barometer, 29·61; transparency, 8½ fathoms.
					Lemon soles,	1	14	1	9	...	...		
					Common dabs,	1	7	...	...	...	...		
					Witch soles,	1	15	2	14	1	11		
					Long rough dabs,	1	9	2	8	13	7		
					,, ,,	12	5–6	...	...	...	...		
	S.E. 53·5	45·3	43·4 32 fath.	Bottom Tow-net.—*Boreophausia*, r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Sagitta*, c.; *Appendicularia*, fr.; small Medusidæ, f.; young *Mytilis*, f.; young Ophiuridæ, f.	Haddocks,	4	11	1	10	...	...		At finish — Wind S.W., force 3; weather, dull, cloudy; sea, moderate; tide, 3½ hours ebb; barometer, 29·60. transparency, 8½ fathoms.
					Whitings,	3	10	1	9	1	8		
					,,	6	5–7	...	...	...	...		
					Gurnards,	6	12–13	6	10–11	3	6–7		
					,,	1	4	...	...	...	...		
STATION X. 24th May 1892. 1.0 p.m. to 2.15 p.m.	W. 59·0	47·0	47·7 8 fath.	Surface Tow-net. — Larval Crustacea, f.; young fish, r.; fish ova, r. Bottom Tow-net. — *Mysis ornata*, r.; *Boreophausia*, r.; *Pseudocuma cercaria*, r.;	Grey skate,	1	15	...	...	...	...	*Hyas araneus*, f.; *Carcinus mænus*, r.; *Pandalus annulicornis*, several; *Eupagurus bern-*	At beginning—Wind S.W., force 5; weather, cloudy; sea, moderate; tide, high water; barometer, 29·64; transparency, 1 fathom.
					Thornback rays,	1	20	2	9	2	8		
					,, ,,	2	5	...	...	...	...		
					Plaice,	2	10	...	...	...	...		
		46·7	47·0		Lemon soles,	1	10	1	8	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station X. 24th May 1892. 1.0 p.m. to 2.15 p.m. —*continued.*			11 fath.	*Diastylis*, r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, c.; *Parapontella longicornis*, r.; *Sagitta*, f.; *Allentha*, sp. r.; young fish, r.	Flounders,	1	12	1	8	...	...	*hardus*, f.; *Asterias*, f.; *Aphrodite*, *Alcyonium*, Zoophytes, r.; mud hardened by *Sabellæ*, — a considerable quantity.	At finish — Wind W.N.W., force 5; weather, cloudy; sea, moderate; tide, 1 hour ebb; barometer, 29·68; transparency, 1 fathom.
					Long rough dabs,	5	7	...	...	...	...		
					Cod,	1	14	1	10	1	9		
					Whitings,	2	8	37	7	11	6		
					,,	1	4	...	...	...	...		
					Pogge,	2	5	1	4	...	...		
Station I. 10th June 1892. 2.0 p.m. to 4.0 p.m.	E. 48·0	52·1	46·0 18 fath.	Surface Tow-net. — *Temora longicornis*, f.; small Medusidæ, fr.; young Crustacea, f.; fish ova, f. Mid-water Tow-net.—*Parathemisto*, sp. r.; *Temora longicornis*, r.; small Medusidæ, c.; post-larval fish, r. Bottom Tow-net. — *Temora longicornis*, f.; small Medusidæ, f.	Plaice,	2	14	11	12	3	10	*Pecten opercularis*, fr; *Mytilus modiolus*, f.; *Buccinum undatum*, r.; *Asterias*, f.; *Echinus esculentus*, c.	At beginning — Wind E., force 5; weather, cloudy; sea, moderate; tide, 5½ hours flood; barometer, 30·03; transparency, 3½ fathoms. At finish—Wind, weather, sea, as before; tide, 1½ hour ebb; barometer, 30·01; transparency, 2½ fathoms.
					,,	3	8	...	...	...	...		
					Lemon soles,	1	14	5	13	18	10–11		
					,, ,,	15	6½–8	...	...	...	...		
	W.50·0	49·5	46·7 13 fath.		Common dabs,	4	10	7	9	10	6½		
					Long rough dabs,	1	9	3	7	...	...		
					Haddocks,	1	13	2	10	2	8		
					Cod,	1	22	1	20	7	14–16		
					,,	39	7–10	...	...	...	...		
					Whitings,	1	9	1	7	...	...		
					Gurnards,	2	14	13	13	22	10		
					,,	25	7–8	...	...	...	...		
					Cat-fish,	12	35	14	28	3	24		
Station II. 10th June 1892. 11.40 a.m. to 1.25 p.m.	E. 48·0	51·6	46·0 17 fath.	Surface Tow-net. — *Temora longicornis*, c.; young Crustacea, f.; small Medusidæ, c. Mid-water Tow-net.—*Parathemisto*, f.; *Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Appendic-*	Starry ray,	1	10½	...	...	...	...	*Asterias*, c.; Ophiuridæ, fr.; *Solaster papposa*, f.; *Echinus esculentus*, f.; Zoophytes and *Ascidians*, fr.	At beginning — Wind E., force 4; weather, cloudy; sea, moderate; tide, 3¼ hours flood; barometer, 30·85; transparency, 4 fathoms. At finish—Wind
					Plaice,	5	14	34	12–13	21	9–10		
					,,	4	6–8	...	...	...	...		
					Lemon soles,	2	11–12	11	9-10	10	7–8		
	W. 50·0	51·4	46.5 14 fath.		Common dabs,	1	9	15	7–8	24	5–6		
					Flounders,	1	8	1	7	...	...		
					Long rough dabs,	1	9	3	8	8	7		
					,,	1	6	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 10th June 1892. 11.40 a.m. to 1.25 p.m. —*continued.*				*ularia*, f.; small Medusidæ, fr.; young Crustacea, fr.; post-larval fish, f. Bottom Tow-net.—*Temora longicornis*, fr.; small Medusidæ, fr.	Turbot,	1	13½	...	...	...	...		E., force 5; weather, sea, as before; tide, 5 hours flood; barometer, 30·04; transparency, 4 fathoms.
					Haddocks,	1	14	6	11	8	8		
					Cod,	1	14	...	...	...	...		
					Whiting,	1	10	...	...	...	...		
					Gurnards,	3	12–13	2	9–10	29	7		
					,,	41	5–6	...	...	...	...		
					Cat-fish,	1	27	...	...	...	...		
STATION III. 13th June 1892. 9.5 a.m. to 11.15 a.m.	W. 47·3 E. 51·0	49·0 49·1	49·0 9 fath. 49·1 10¼ fath.	Surface Tow-net.—*Temora longicornis*, fr.; small Medusidæ, fr.; young Crustacea, f.; fish ova, r.; post-larval fish, r. Mid-water Tow-net—*Parathemisto*, sp. r.; *Temora longicornis*, f.; small Medusidæ, c.; young Crustacea, f.; post-larval fish, 3. Bottom Tow-net.—*Temora longicornis*, f.; small Medusidæ, f.; very little in net.	Thornback ray,	1	26	...	...	...	...	*Pecten opercularis*, fr.; *Portunus*, sp. r.; *Nephrops, norvegicus*, f.; *Asterias*, fr.; *Ophiothrix rosula*, f.; *Solaster papposa*, fr.; *Echinus esculentus*, f.; *Alcyonium*, fr.; sea-weed, small quantity.	At beginning —Wind N.N.W., force 4; weather, dull, cold; sea, slight; tide, 4¾ hours ebb; barometer, 30·11; transparency, 2½ fathoms. At finish—Wind variable, force 2; weather, cloudy; sea, slight; tide, 1 hour flood; barometer, 30·13; transparency, 3 fathoms.
					Plaice,	2	14	14	13	28	12		
					,,	19	9	...	...	...	...		
					Lemon soles,	9	12–14	12	10	6	8		
					,, ,,	20	6–7	...	...	...	...		
					Common dabs,	2	10	19	9	22	7		
					,, ,,	32	5½	...	...	...	...		
					Flounders,	3	8	...	...	...	...		
					Long rough dabs,	2	11–12	8	9–10	24	7½		
					,, ,,	10	6	...	...	...	...		
					Haddocks,	1	13	11	7	...	...		
					Cod,	1	18	1	17	2	15		
					,,	4	8	...	...	...	...		
					Whitings,	3	13–14	2	11	2	10		
					,,	4	7	...	...	...	...		
					Gurnards,	4	14–15	2	13	2	10		
					,,	57	6½–8	...	...	...	...		
					Anglers,	1	27	1	19	...	...		
					Cat-fish,	1	32	1	30	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 14th June 1892. 2.35 p.m. to 4.50 p.m.	E. 60·0 W. 61·0	50·0 50·3	49·2 7½ fath. 49·8 6½ fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; *Anomalocera patersonni*, r.; post-larval fish, r. Mid-water Tow-net.—Small Medusidæ, c. Bottom Tow-net.—*Calanus finmarchicus*, r.; *Temora longicornis*, r.; small Medusidæ, fr.	Thornback rays, .	1	24	5	13	3	19	*Pecten opercularis*, c.; *Buccinum undatum*, r.; *Hyas araneus*, f.; *Nephrops norvegicus*, f.; *Asterias*, f.; *Solaster endeca*, f.; *Echinus esculentus*, f.; *Flustra*, sp. f.; *Chalina*, sp. fr.; weed, f.	At beginning —Wind W.S.W., force 1; weather, cloudy; sea, slight; tide, 3½ hours flood; barometer, 30·12; transparency, 3 fathoms. At finish—Wind W.S.W., force 1; weather, cloudy; sea, smooth; tide, 5¾ hours flood; barometer, 30·09; transparency, 2 fathoms.
					,, ,, .	1	16	...	...	...	...		
					Plaice, . .	1	14	21	12	39	10		
					,, . .	19	8½	...	...	...	...		
					Lemon soles, .	1	12	3	10–11	6	9		
					,, ,, .	4	7	...	...	...	...		
					Common dabs, .	5	10–11	13	9	8	7½		
					,, ,, .	12	4½–6	...	...	...	...		
					Long rough dabs,	1	10	2	9	4	8		
					Cod, . . .	4	18–21	1	15	2	13		
					,, . . .	5	7–10	...	...	...	...		
					Whitings, . .	1	9	1	8	...	...		
					Gurnards, . .	3	13–14	14	10–12	13	8		
					Dragonets, . .	6	7	...	...	...	...		
					Anglers, . .	1	6½	...	...	...	...		
						1	22	1	18	...	...		
STATION V. 13th June 1892. 1.35 p.m. to 4.5 p.m.	E. 52·0 W. 54·0	48·0 48·2	49·8 24 fath. 45·7 29 fath.	Surface Tow-net.—*Temora longicornis*, f.; *Acartia longiremis*, f.; *Anomalocera patersonni*, f.; small Medusidæ, f.; young Crustace, f.; fish ova, f.; post-larval fish, 1. Mid-water Tow-net.—*Parathemisto*, f.; *Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Sagitta*, fr.; small Medusidæ, fr.;	Grey skates, .	1	21	1	15	...	...	*Fusus antiquus*, several; *Asterias*, fr.; *Actinoloba*, f.	At beginning — Wind N.N.E., force 4; weather, cloudy; sea, strong north easterly swell; tide, 3½ hours flood; barometer 30·12; transparency, 3 fathoms. At finish—Wind variable, force 2; weather, cloudy; sea, strong easterly
					Thornback ray, .	1	24	...	...	...	...		
					Plaice, . .	5	16–17	11	15	1	12		
					,, . . .		11	...	...	...	...		
					Lemon soles, .	4	14–15	6	12–13	5	10		
					,, ,, .	3	8	...	...	...	...		
					Common dabs, .	3	10½	3	8	5	7		
					Witch soles, .	1	18	1	13	...	...		
					Sail fluke, . .	1	18	...	...	...	...		
					Long rough dabs,	2	9–10	14	8	24	6		
					,, ,,	10	5	...	...	...	...		
					Haddocks, . .	1	20	9	15	19	12		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION V. 13th June 1892. 1.35 p.m. to 4.5 p.m. —*continued.*				*Appendicularia*, fr.; young Crustacea, fr.; fish ova, r.; post-larval fish, f. Bottom Tow-net. — *Temora longicornis*, f.; *Sagitta*, f.; small Medusidæ, f.; *Appendicularia*, f.	Haddocks,	32	7–9	...	...	...	...		swell; tide, $5\frac{3}{4}$ hours flood; barometer, 30·12; transparency, 3 fathoms.
					Cod,	1	27	2	19–20	1	16		
					,,	7	7–9	...	...	...	...		
					Whitings,	1	10	1	9	1	8		
					,,	6	7	...	...	...	...		
					Gurnards,	1	14	13	12	10	9		
					,,	9	8	...	...	...	...		
STATION VI. 15th June 1892. 4.30 p.m. to 5.30 p.m.	E. 55·0 W. 54·5	49·5 49·5	47·5 16 fath. 48·0 15 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; small Medusidæ, fr.; fish ova, f. Mid-water Tow-net—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Podon*, sp. f.; *Sagitta*, f.; *Appendicularia*, f.; small Medusidæ, fr.; young Crustacea, f.; post-larval fish, r. Bottom Tow-net.—*Temora longicornis*, f.; *Acartia longiremis*, fr.; *Appendicularia*, fr.; small Medusidæ, fr.	Plaice,	2	24	1	20	6	15	*Asterias*, fr.; *Solaster endeca*, r.; *Spatangus purpureus*, f.	At beginning—Wind N.W., force 4; weather, dull; sea, slight; tide, $4\frac{3}{5}$ hours flood; barometer, 29·88; transparency, 5 fathoms. At finish — Wind N.W., force 4; weather, dull; sea, slight; tide, $5\frac{3}{4}$ hours flood; barometer, 29·86; transparency, 5 fathoms.
					,,	3	10–13	...	...	...	...		
					Lemon soles,	1	13	1	14	1	11		
					,, ,,	1	10	...	...	...	...		
					Common dabs,	1	7	2	5	...	...		
					Brill,	1	18	...	...	...	...		
					Halibut,	1	20	...	...	...	...		
					Cod,	1	8	...	...	...	...		
					Gurnards,	2	12–13	16	10–11	12	9		
					,,	12	7–8	...	...	...	...		
STATION VII. 15th June 1892. 12.20 p.m. to 2.15 p.m.	E. 60·5 W. 61·0	49·8 50·5	48·1 16 fath. 49·6 9 fath.	Surface Tow-net. — *Temora longicornis*, r.; small Medusidæ, ab. Mid-water Tow-net.—*Temora longicornis*, r.; small Medusidæ, c.; post-larval fish, f.	Thornback rays,	1	18	1	6	...	...	*Hyas coarctatus*, several small; *Ascidians*, fr.; *Asterias*, fr.; *Solaster endeca*, f.; *Echinus*	At begining — Wind S., force light; weather, cloudy, fine; sea, smooth; tide, $\frac{1}{2}$ hour flood; barometer 29·89; transparency, 5 fathoms.
					Plaice,	1	22	1	14	11	12		
					,,	9	9–10	...	...	...	...		
					Lemon soles,	1	13	1	9	3	8		
					,, ,,	1	$5\frac{1}{2}$	...	...	...	...		
					Common dabs,	1	11	23	8–9	51	6–7		
					,, ,,	41	5	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VII. 15th June 1892. 12.20 p.m. to 2.15 p.m. —*continued.*				Bottom Tow-net.—Small *Eolis*, r.; small Medusidæ, fr.	Long rough dabs,	2	8	2	7	1	6	*esculentus*, r.; *Alcyonium*, large Medusidæ, and Actinidæ, f.	At finish—Wind W.S.W., force 3; weather cloudy; sea, slight; tide, 2½ hours flood; barometer, 29·91; transparency 4½ fathoms.
					Flounder,	1	9	...	...	...	...		
					Black sole,	1	16	...	...	...	...		
					Haddocks,	2	12	1	11	2	8		
					Whitings,	1	9	1	8	...	...		
					Gurnards,	2	9	22	7	11	6		
					Dragonet,	1	7	1	8	...	...		
STATION VIII. 9th June 1892. 1.10 p.m. to 3.5 p.m.	N.E. 62·0	48·6	43·8 27½ fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; *Temora longicornis*, f.; *Acartia*, sp. fr.; *Centropages*, sp. f.; *Parathemisto*. r.; *Sagitta*, f.; small Medusidæ, f.; ova, f. Mid-water Tow-net.—*Thysanoessa*, sp. r.; *Calanus finmarchicus*, f.; *Acartia*, f.; *Centropages*, f.; *Evadne*, f.; *Sagitta*, ab.; small Medusidæ, c.; young *Thysanoessa* and other Crustacea, f.; several post-larval fish. Bottom Tow-net.—*Temora longicornis*, r.; *Sagitta*, r.; *Appendicularia*, r.; small Medusidæ, fr.	Plaice,	1	17	1	14	3	11	*Asterias*, f.; *Solaster endeca*, r.; *Echinus esculentus*, fr.; *Amphidotus cordatus*, f.; *Actinoloba*, fr.; *Alcyonium*, f.	At beginning — Wind S.S.E., force 2; weather, hazy; sea, slight; tide, 5¾ hours flood; barometer, 30·17; transparency, 9 fathoms. At finish—Wind S.E., force 2; weather, sea, as before; tide, 1⅔ hour ebb; barometer, 30·13; transparency, 6 fathoms.
					Lemon soles,	1	15	1	10	2	9		
					Common dabs,	2	8	3	7	2	6		
					,, ,,	13	5	...	...	...	...		
					Witch soles,	1	20	...	...	...	...		
	S.W. 65·0	53·2	44·1 21 fath.		Long rough dabs,	15	7	7	6	...	...		
					Haddocks,	2	14–15	4	11–12	22	7–9		
					Whitings,	1	14	1	8	1	7		
					Brassie,	1	9	2	7	...	...		
					Dragonet,	1	7	...	...	...	...		
STATION IX. 9th June 1892. 10.50 a.m. to 12.45 p.m.	S.E. 61·0	50·0	43·5 33 fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; *Acartia*, sp. f.; *Centropages*, sp. r.; small Medusidæ, f.; fish ova, f.; post-larval fish, 1. Mid-water Tow-net.—*Para-*	Long rough dabs,	1	7½	1	6	...	...	*Octopus*, sp. 1 — a large Medusid; a few *Asterias*.	At beginning — Wind S.S.E., force, 1; weather, hazy; sea, smooth; tide, 3½ hours flood; bar-
					Lumpenus lampetriformis	1	12½	1	9½	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Sur-face.	Bot-tom.			No.	Inches	No.	Inches	No.	Inches		
STATION IX. 9th June 1892.* 10.50 a.m. to 12.45 p.m. —*continued.*	N.W. 64·0	50·9	43·2 29½ fath.	*themisto*, sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Evadne*, sp. f.; *Sagitta*, c.; *Appendicularia*, f.; small Medusidæ, f.; several post-larval fish. Bottom Tow-net.—*Temora longicornis*, f.; *Sagitta*, r.; *Appendicularia*, f.; small Medusidæ, fr.									ometer, 30·22; transparency, 9½ fathoms. At finish — Wind S.E., force 2; weather, hazy; sea, slight; tide, 5¼ hours flood; barometer, 30·20; transparency, 8½ fathoms.
STATION X. 14th June 1892. 10.55 a.m. to 12.15 p.m.	E. 53·5 W. 55·0	50·5 50·0	50·5 8 fath. 50·5 7½ fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Acartia*, sp. f.; young Crustacea, r.; larval and post-larval fish, f. Mid-water Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Acartia longiremis*, f.; *Alteutha*, sp. r.; *Sagitta*, f.; post-larval fish, r. Bottom Tow-net. — Contained a large quantity of mud.	Thornback rays, .	1	6	1	9	1	10	*Hyas araneus*, f.; *Eupagurus bernhardus*, several; *Pandalus annulicornis*, f.; *Asterias*, f.; *Echinus miliaris*, f.; a large quantity of hardened mud.	At beginning—Wind calm, force 0; weather, clear, fine; sea, smooth; tide, low water; barometer, 30·18; transparency, ½ fathom. At finish — Wind calm, force 0; weather, clear, fine; sea, smooth; tide 2¼ hours flood; barometer, 30·17; transparency, ½ fathom.
					Cod, . . .	1	10	1	17	1	19		
					Whitings, . .	2	7	...	...	...	...		
					Pogge, .	1	6	...	...	...	...		
STATION I. 23rd July 1892. 11.35 a.m. to 1.30 p.m.	E. 59·4 W. 63·0	53·2 53·4	57·1 15½ fath. 51·2 14½ fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Evadne*, f.; larval Crustaceans, f.; small Ctenophora, f.; fish ova, r. Bottom Tow-net.—*Cumaceans*, fr.; *Calanus fin-*	Grey skate, .	1	20	...	...	...	...	*Pecten opercularis*, fr.; *Mytilus modiolus*, several; *Fusus antiquus*, f.; *Buccinum undatum*, f.; *Ascid-*	At beginning — Wind W., force 3; weather, cloudy; sea, slight; tide, 3½ hours flood; barometer, 20·24; transparency, 6 fathoms.
					Plaice, . .	21	13–14	21	11	33	10		
					,, . .	22	7½	...	...	...	...		
					Lemon soles, .	6	12	12	11	28	8-9		
					,, ,, .	13	6½	...	...	...	...		
					Common dabs, .	5	10–11	38	7–8	19	5½		
					,, ,, .	11	3	...	...	...	...		

* Trawl caught on an old anchor and was slightly damaged.

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 23rd July 1892. 11.35 a.m. to 1.30 p.m. —*continued.*				*marchicus*, fr.; *Temora longicornis*, f.; larval Crustaceans, f.; *Sagitta*, fr.; *Tomopteris*, f.	Long rough dabs,	14	8	13	7	...	...	*ians*, fr.; *Nephrops norvegicus*, fr.; *Asterias*, sp. fr.; *Solaster papposa*, f.; *Echinus esculentus*, fr.; *Alcyonium*, c.	At finish—Wind E., force 3; weather and sea as before; tide, 5½ hours flood; barometer, 30·26; transparency, 2½ fathoms.
					Haddock,	1	7	...	...	...	...		
					Cod,	1	16	9	9	...	...		
					Whitings,	2	9	1	7	1	5		
					Saithe,	17	10–12	....	...	...	...		
					Gurnards,	3	13	8	8	30	5–6½		
					Hake,	1	8	1	5	...	...		
					Anglers	1	24	4	20	5	18		
					Cat-fish,	1	35	...	...	...	...		
					Dragonet,	1	8	...	...	..	...		
					Goby,	1	2	...	...	...	...		
STATION II. 20th July 1892. 11.0 a.m. to 12.45 p.m.	52·0	51·1	51·0 14 fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Evadne*, f.; larval Crustacea, f.; Ctenophora, f. Bottom Tow-net.—*Temora longicornis*, f.; *Acartia longiremis*, f.; *Calanus finmarchicus*, r.; young Crustacea, f.; *Sagitta*, f.; *Tomopteris*, f.	Thornback ray,	1	18	...	...	...	...	*Fusus antiquus*, r.; *Nephrops norvegicus*, r.; *Asterias*, fr.; *Solaster papposa*, *S. endeca*, fr.; *Ophiothrix rosula*, c.; *Alcyonium*, f.; *Ascidians*, f.	At beginning — Wind E., force 2; weather, dull; sea, strong easterly swell; tide, barometer, 30·12; transparency, 4 fathoms. At finish—Wind S.E., force 2; weather, dull; sea as before; tide, barometer 30·12; transparency, 5 fathoms.
					Plaice,	1	18	22	14–15	22	12		
					,,	42	9	...	...	...	...		
	52·5	51·4	50·9 15½ fath.		Lemon soles,	1	12	6	10–11	19	8–9		
					,, ,,	3	6	...	...	...	...		
					Common dabs,	6	8–9	46	6–7	26	3–5		
					Long rough dabs,	1	11	6	9–10	9	8		
					,, ,,	7	5–6	...	...	...	...		
					Haddocks,	1	10	5	9	1	4		
					Cod,	1	9	...	...	...	...		
					Whitings,	1	10	13	7	3	6		
					Gurnards,	1	11	4	9–10	12	7		
					,,	25	4½–6	...	...	...	...		
					Dragonet,	2	8	1	6	...	...		
					Pogge,	2	4½	1	3½	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 25th July 1892. 9.23 a.m. to 11.40 p.m.	W. 52·5 E. 55·0	52·8 53·9	51·6 9 fath. 52·7 9½ fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Evadne*, f.; larval Crustacea, fr.; small Ctenophora, f. Bottom Tow-net.—*Leucon*, sp. f.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, c.; *Sagitta*, c.; larval Crustacea, fr.; young post-larval fish, f.	Thornback ray, .	1	22	...	...	...	...	*Pecten opercularis*, ab.; *Mytilus modiolus*, r.; *Portunus depurator*, f.; *Nephrops norvegicus*, f.; *Ophiothrix rosula*, fr.; *Asterias*, fr.; *Solaster papposa*, fr.; *Echinus esculentus*, fr.; *Actinoloba* and *Actinia*, r.; *Flustra* and other Zoophytes, f.	At beginning — Wind E.S.E., force 1; weather, light fog; sea, smooth; tide, low water; barometer, 30·30; transparency, 2½ fathoms. At finish—Wind, weather, sea as before; tide, 2 hours flood; barometer, 30·28; transparency, 2½ fathoms.
					Plaice, . .	7	13–14	37	11–12	24	10		
					,, . . .	7	8	...	...	...	...		
					Lemon soles, .	19	11–12	16	10–9	16	8		
					,, ,, .	3	5–7	...	...	...	...		
					Common dabs, .	1	11	2	10	52	7–9		
					,, ,, .	47	4–6	...	...	...	...		
					Long rough dabs,	2	10	6	9	11	7		
					,, ,,	7	6	...	...	...	...		
					Cod, . . .	1	14	1	12	2	11		
					,, . . .	15	8–10	...	...	...	...		
					Whitings, . . .	1	11	10	9	13	8		
					,, . .	7	7	...	...	...	...		
					Saithe, . .	1	10	...	...	...	...		
					Gurnards, . .	2	15–16	3	12–14	19	9–11		
					,, . .	30	4–7	...	...	...	...		
					Anglers, . .	3	20	3	15	...	...		
					Dragonet, . .	2	9	1	6	...	...		
STATION IV. 25th July 1892. 12.25 p.m. to 3.0 p.m.	E. 55·0 W. 65·0	55·0 54·7	53·9 7 fath. 53·9 6 fath.	Surface Tow-net. — *Acartia longiremis*, f.; *Evadne*, fr.; *Appendicularia*, r.; larval Crustacea, fr.; small Ctenophora, f. Bottom Tow-net.—*Hippolyte*, sp. r.; *Calanus finmarchicus*, f.; *Sagitta*, f.; larval and young Crustacea, f.; small Ctenophora, f.	Thornback rays, .	1	24	2	20	1	17	*Pecten opercularis*, ab.; *Mytilus modiolus*, f.; *Tritonia hombergi*, r.; *Eolis*, sp. (dark purple filaments with white tips), r.; *Doris*, sp. (yellow coloured), r.; *Loligo* (young) fr.; *Ascidia*, sp. f.; *Portunus de-	At beginning — Wind E.N.E., force 2; weather, light fog; sea, slight; tide, 2¾ hours flood; barometer, 30·27; transparency, 3 fathoms. At finish—Wind N.E., force 2; weather and sea as
					Plaice, . .	24	12	67	11	38	10		
					,, . .	39	5–8	...	...	...	...		
					Lemon soles, .	1	12	7	10	3	9		
					,, ,, .	9	8	...	...	...	...		
					Common dabs, .	5	11–12	7	8	28	5–6		
					Flounder, . .	1	7	...	...	...	...		
					Long rough dabs,	4	8	...	...	...	...		
					Cod, . . .	4	12	5	10	3	9		
					Whitings, . .	8	10	30	8	5	6		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 25th July 1892. 12.25 p.m. to 3.0 p.m. —*continued.*					Gurnards,	7	16	4	14	9	11	*purator*, c.; *Nephrops*, f.; *Hyas araneus*, f.; *Asterias*, fr.; *Solaster papposa*, f.; *Echinus esculentus*, f.; *Chalina*, sp. ab.; *Alcyonium*, f.; *Flustra*, fr.	before; tide, 5¼ hours flood; barometer, 30·25; transparency, 1¾ fathoms.
					,,	19	4–6	...	...	...	...		
					Anglers,	1	23	1	20	...	...		
					Dragonet,	1	8	...	...	...	...		
					Sea trout,	1	9½	...	...	...	...		
					Goby,	4	2–3	...	...	...	...		
STATION V. 22nd July 1892. 12.5 p.m. to 2.30 p.m.	W. 60·0	53·2	49·0 30 fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Anomalocera patersonni*, r.; *Evadne*, fr.; small Ctenophora, young starfish and Crustacea, f.; fish ova, rather rare.	Grey skate,	1	14	...	...	...	...	*Fusus antiquus*, f.; *Nephrops norvegicus*, fr.; *Asterias*, f.; *Alcyonium*, r.; large Medusids, f.; *Actinoloba*, f.	At beginning—Wind S.W., force 1; weather, dull; sea, slight; tide, 5 hours flood; barometer, 30·18; transparency, 7 fathoms.
					Starry ray,	1	9	...	...	...	...		
					Plaice,	3	17–19	14	15–16	5	13		
					,,	8	11	...	...	...	...		
					Lemon soles,	1	14	3	10	5	8		
					Common dabs,	2	9	8	8	8	7		
	E. 59·0	52·0	49·3 24½ fath.	Bottom Tow-net.—*Cumacea*, f.; *Calanus finmarchicus*, f.; *Sagitta*, c.; a considerable quantity of fine mud.	,, ,,	1	4	...	...	...	...		
					Witch soles,	1	18	2	17	1	9		At finish—Wind W., force 2; weather and sea as before; tide, 1¼ hour ebb; barometer, 30·20; transparency, 7 fathoms.
					Long rough dabs,	1	11	8	9	63	8		
					,, ,,	57	5½–7	...	...	...	...		
					Haddocks,	3	14–16	56	10–13	238	8–9		
					,,	1	3	...	...	...	...		
					Cod,	1	41	3	33–39	2	15–17		
					,,	2	9½	...	...	...	...		
					Whitings,	2	12	1	10	5	8		
					,,	5	6	...	...	...	...		
					Gurnards,	1	14	8	13	4	12		
					,,	16	8	...	...	...	...		
					Anglers,	1	45	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrat Fauna, &c., brought up in Trawl net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Sur-face.	Bot-tom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 20th July 1892. 1.50 p.m. to 3.0 p.m.	W. 52·5	51·6	51·0 12 fath.	Surface Tow-net. — *Acartia longiremis*, f.; *Evadne*, f.; Ctenophora, f. Bottom Tow-net.—Contained a quantity of coarse sand among which were several young Sand-eels, Amphipods, &c.	Plaice,	1	27	2	16–17	9	15	*Asterias*, f.; *Solaster papposa* and *endeca*, f.; *Astropecten irregularis*, r.; *Ophiothrix rosula*, f.; *Spatangus purpureus*, c.; *Cucumaria* (white), r.; large Medusidæ, f.	At beginning — Wind E., force 4; weather, dull; sea, easterly swell; tide, barometer, 30·13; transparency, 5 fathoms. At finish—Wind E., force 3; weather, dull; sea as before; tide, barometer, 30·15; transparency, 5½ fathoms.
					,,	3	12–13	...	...	...	...		
					Lemon soles,	3	14	3	12–13	6	9–10		
					,, ,,	1	7	...	...	...	...		
					Common dabs,	2	11	8	8–9	9	7		
	E. 53·5	51·8	51·0 14 fath.		,, ,,	6	5	...	...	...	...		
					Black sole,	1	18	...	...	...	...		
					Turbot,	1	26	...	...	...	...		
					Haddocks,	1	13	1	10	...	...		
					Cod,	1	9	...	...	...	...		
					Whitings,	1	12	2	7	...	...		
					Gurnards,	14	11–13	45	9	46	7		
					,,	4	4–6	...	...	...	...		
					Anglers,	1	39	1	30	1	22		
					,,	1	17	...	...	...	...		
STATION VII. 22nd July 1892. 3.30 p.m. to 5.25 p.m.	E. 57·0	52·9	51·6 19 fath.	Surface Tow-net. — *Calanus finmarchicus*, f.; *Acartia longiremis*, f.; *Centropages*, r.; *Evadne*, fr.; larval Crustacea, f.; Ctenophora, f.; fish ova, f. Bottom Tow-net.—*Atylus*, sp. r.; *Calanus finmarchicus*, fr.; *Acartia longiremis*, fr.; *Alteutha*, sp. r.; *Sagitta*, f.; post-larval fish, several.	Thornback rays,	1	21	1	3	...	...	*Buccinum undatum*, f.; *Rossia*, r.; *Corystes cassivelaunus*, r.; *Nephrops norvegicus*, f.; *Ascidians*, f.; *Asterias*, fr.; *Solaster papposa* and *endeca*, f.; *Actinia*, sp. r.;	At beginning — Wind W., force 2; weather, dull; sea slight; tide, 2¼ hours ebb; barometer, 30·18; transparency, 5½ fathoms. At finish—Wind W., force 3; weather and sea as before; tide, 4 hours ebb; barometer, 30·19;
					Plaice,	1	17	6	14–15	10	13		
					,,	8	10	...	...	...	...		
					Lemon soles,	1	11	8	10	3	8		
					,, ,,	5	6	...	...	...	...		
					Common dabs,	6	9–10	42	8	66	6		
	W. 58·3	52·7	51·1 10 fath.		,, ,,	107	4–5	...	...	...	...		
					Black sole,	1	17	1	15	...	...		
					Long rough dabs,	1	9	2	8	11	7		
					Turbot,	1	21	...	...	...	...		
					Haddocks,	14	13	43	9	37	8		
					Whitings,	3	9	6	8	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VII. 22nd July 1892. 3.30 p.m. to 5.25 p.m. —*continued.*					Ling, . . .	1	15	...	...	...	...	*Flustra*, f.; *Alcyonium*, f.; large Medusids, fr.	transparency, 4½ fathoms.
					Gurnards, . .	2	12½	2	11	34	7–10		
					" . .	14	4–6	...	...	...	...		
					Anglers, . .	1	36	1	28	...	...		
					Dragonet, . .	2	8	2	7	...	...		
					Pogge, . .	1	3	...	...	...	...		
STATION VIII. 21st July 1892. 11.15 a.m. to 1.25 p.m.	S.W. 61·0	51·4	49·6 22½ fath.	Surface Tow-net.—*Acartia longiremis*, f.; small Ctenophora, fr.; *Evadne*, f.; young *Motella mustella*, 1; fish ova, f. Bottom Tow-net.—*Parathemisto*, f.; *Tauria*, sp. r.; *Calanus finmarchicus*, fr.; *Acartia longiremis*, f.; *Centropages*, sp. f.; *Sagitta*, fr.; Ctenophora, f.; post-larval fish, f.	Grey skates, .	2	17	...	...	...	...	*Fusus antiquus*, r.; *Nephrops norvegicus*, f.; *Asterias*, f.; *Solaster endeca*, r.	At beginning — Wind, calm; weather, hazy; sea, strong north easterly swell; tide, barometer, 30·16; transparency, 8 fathoms. At finish—Wind S.S.E., force 2; weather and sea as before; tide, barometer, 30·13; transparency, 8½ fathoms.
					Starry rays, .	1	12	1	10	1	9		
					Plaice, . .	1	16	1	15	1	13		
					" . .	2	11	...	...	...	...		
					Lemon soles, .	1	10	...	...	...	...		
					Common dabs, .	1	9	2	8	12	6–7		
					" " .	8	4	...	...	...	...		
	N.E. 56·0	51·4	49·0 29 fath.		Witch soles, .	3	19	1	17	3	12		
					" " .	2	9	...	...	..	...		
					Sail fluke, . .	1	19	...	...	...	...		
					Long rough dabs,	3	8	44	7	16	6		
					" "	12	5	...	...	...	...		
					Haddocks, . .	1	13	43	8–9	35	7		
					" . .	4	3	...	...	...	...		
					Whitings, . .	2	10–11	17	8–9	9	6		
					" . .	3	5	...	...	...	...		
					Gurnards, . .	1	15	1	13	28	8–11		
					" . .	42	4–7	...	...	...	...		
					Dragonet, . .	1	7	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate, Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IX. 21st July 1892. 2.25 p.m. to 2.15 p.m.	S.E. 55·0	52·5	46·8 33 fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Evadne*, fr.; young Crustacea, f.; Ctenophora, f.; fish ova, r. Bottom Tow-net. — *Erythrops*, sp. r.; Euphausidæ, r.; *Cumacea*, r.; *Parathemisto*, several; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Acartia longiremis*, f.; *Centropages typicus*, f.; *Sagitta*, fr.; Ctenophora, fr.	Common dabs,	1	8	1	3½	...	...	*Asterias*, f.; large Medusidæ, f.	At beginning—Wind S.E., force 5; weather, a little hazy; sea, strong north easterly swell; tide, barometer, 30·12; transparency, 9½ fathoms. At finish — Wind S.S.E., force 4; weather and sea as before; tide, barometer, 30·12; transparency, 9 fathoms.
					Flounder (left-handed),	1	8	...	...	...	...		
	N.W.	52·3	47·0 30 fath.		Long rough dabs,	1	8	3	7	11	6		
					,, ,,	2	5	...	...	...	...		
					Haddocks,	1	10	2	9	3	8		
					,,	1	3	...	...	...	...		
					Whitings,	1	11	1	10	1	9		
					,,	4	7–8	...	...	...	...		
					Gurnard,	1	14	...	...	...	...		
STATION X. 26th July 1892. 11.0 a.m. to 11.50 a.m.	E. 61·0	56·5	55·0 8 fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Centropages*, sp. r.; *Sagitta*, f.; larval Crustacea, f. Bottom Tow-net.—*Crangon allmanni*, f.; *Mysis flexuosus*, r.; *Mysis ornatus*, fr.; *M. spiritus*, f.; *M. inermis*, f.; *Gastrosaccus spinifer*, fr.; *Diastylis*, sp. r.; *Cuma*, sp. (*goodsiri?*) r.; *Atylus bispinosus*, r.; *Acartia longiremis*, f.; *Temora longicornis*, f.; *Alteutha purpureus*, r.; *Sagitta*, fr.; young Gobies, r.	Thornback rays,	2	19–21	2	14–15	5	10–12	*Buccinum undatum*, r.; *Hyas araneus*, fr.; *Carcinus mænas*, r.; *Portunus holsatus*, f.; *Eupagurus bernhardus*, fr.; *Pandalus annulicornis*, fr.; *Asterias*, f.; *Actiniæ*, fr.; *Alcyonidium gelatinosum*, f.; aggregate masses of the mud tubes of *Sabellæ*, ab.	At beginning — Wind E. by S., force 3; weather, hazy; sea, slight; tide, low water; barometer, 30·30; transparency, ¾ fathom. At finish—Wind, weather, and sea as before; tide, 1 hour flood; barometer and transparency as before.
					,, ,,	4	3½–7	...	...	...	...		
					Plaice,	2	9	...	...	...	...		
					Cod,	1	19	1	15	2	11		
	W. 63·0	57·0	56·0 6 fath.		Whitings,	86	7–10	...	...	...	...		
					Pogge,	1	5	1	4	...	...		
					Picked dog-fish,	1	30	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION O (Limekilnes Station) 22nd Sept. 1892. 3.15 p.m. to 4.0 p.m.	E. 56·0 W. 56·0	11·1 11·1	11·4 11 fath. 11·3 5 fath.	Surface Tow-net.—*Gammarus*, sp. r.; *Macropsis slabberi*, r.; *Caligus*, sp. fr.; young Crustacea, f.; some Zostera. Bottom Tow-net.—*Mysis ornatus*, r.; *Sagitta*, f.; young Crustacea, f. (very little in either net).	Thornback rays, .	1	13	3	11	1	9	*Hyas araneus*, f.; *Carcinus mœnas*, r.; *Portunus depurator* and *holsatus*, fr.; *Eupagurus*, f.; *Pandalus annulicornis* and *Crangon*, sp. f.; *Galathea*, sp. r.; *Asterias*, f.; *Echinus miliaris*, r.; *Actinidæ* and *Alcyonidium*, f.; a large quantity of mud.	At beginning—Wind E., force 4; weather, clear, fine; sea, slight; tide, near high water; barometer, 30·26; transparency, 1 fathom. At finish — Wind, weather and sea as before; tide, shortly after high water; barometer, 30·27; transparency, $\frac{2}{3}$ fathom.
					,, ,, .	1	6	...	...	...	...		
					Plaice, . .	1	10	...	...	...	...		
					Lemon sole, .	1	9	...	...	...	...		
					Cod, . . .	1	$3\frac{1}{2}$	...	...	...	...		
					Whitings, . .	1	9	6	$4\frac{1}{2}$–4	...	...		
					Liparis, sp. .	1	3	...	...	...	...		
STATION I. 21st Sept. 1892. 2.40 p.m. to 4.35 p.m.	E. 58·0 W. 54·2	11·2 11·1	11·4 18 fath. 11·4 13 fath.	Surface Tow-net.—*Acartia longiremis*, f.; young Crustacea, f.; very little in surface tow-net. Bottom Tow-net.—*Thysanoessa*, sp. f.; *Boreophausia*, sp. f.: *Pseudocuma cercaria*, r.; *Calanus finmarchicus*, f.; *Acartia longiremis*, f.; *Temora longicornis*, fr., *Sagitta*, ab.; young Crustacea, fr.	Grey skates, .	1	16	1	14	...	...	*Pecten opercularis*, fr.; *Buccinum undatum*, f.; *Eledon cirrhosa*, r.; *Loligo*, f.; *Cancer pagurus*, r.; *Nephrops norvegicus*, fr.; *Asterias*, f.; *Echinus esculentus*, fr.; *Actinidæ*, f.	At beginning — Wind E., force 3; weather, clear; sea, slight; tide, high water; barometer, 30·24; transparency, 4 fathoms. At finish—Wind, weather, and sea as before; tide, 2 hours ebb; barometer, 30·26; transparency, $2\frac{1}{2}$ fathoms.
					Thornback rays, .	1	22	1	19	...	...		
					Plaice, . .	2	15-16	18	14	27	12		
					,, . .	45	9–10	...	...	...	...		
					Lemon soles, .	1	14	7	12	32	8		
					,, ,, .	33	7–8	...	...	...	...		
					Common dabs, .	5	10–11	42	8–9	17	6		
					,, ,, .	155	$2\frac{1}{2}$ 4	...	...	...	...		
					Long rough dabs,	14	9	12	8	5	6		
					Haddocks, . .	3	5	...	...	...	...		
					Cod, . . .	2	17–18	6	13	22	11		
					,, . . .	1	7	...	...	...	...		
					Whitings, . .	1	16	12	10	12	9		
					,, . .	13	4–5	...	...	...	...		
					Gurnards, . .	5	14	8	10	8	8		
					,, . .	12	4–6	...	...	...	...		
					Anglers, . .	1	28	1	23	2	20		
					,, . .	2	18	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 21st Sept. 1892. 11.33 a.m. to 1.35 p.m.	E. 51·0	11·3	11·4 11 fath.	Surface Tow-net. — *Acartia longiremis*, fr.; Ctenophora, fr.; small (young) Crustacea, f. Bottom Tow-net.—*Temora longicornis*, f.; *Sagitta*, c.; a quantity of sandy mud with broken shells.	Thornback rays,	1	19	1	12	...	...	*Fusus antiquus*, f.; *Loligo*, f.; *Cancer pagurus*, r.; *Portunus depurator* and *holsatus*, fr.; *Asterias*, f.; *Ophiothrix rosula*, ab.; *Solaster papposa* and *endeca*, f.; *Echinus esculentus*, r.; *Alcyonium*, c.; a quantity of rubbish (pieces of coal and stuff thrown overboard by passing vessels).	At beginning — Wind E., force 3; weather, cloudy; sea, strong easterly swell; tide, 3 hours flood; barometer, 30·25; transparency, 4 fathoms. At finish—Wind as before; weather, clear; sea as before; tide, 5 hours flood; barometer, 30·24; transparency, 4 fathoms.
					Plaice,	1	20	3	15–16	28	12		
					,,	66	9–10	...	...	...	...		
					Lemon soles,	1	14	7	11–12	12	10		
	W. 57·0	11·1	11·3 13 fath.		,, ,,	31	6–8	...	...	...	...		
					Common dabs,	5	8	62	7	76	6		
					,, ,,	212	4–5	...	...	...	...		
					Long rough dabs,	1	11	1	10	8	9		
					,, ,,	11	7	...	...	...	...		
					Haddocks,	1	15	5	9–10	21	4–5		
					Cod,	2	15	3	12	3	10		
					,,	1	9	...	...	...	...		
					Whitings,	3	9	12	8	2	6		
					Gurnards,	1	13	7	11–10	21	8		
					,,	99	4–5	...	...	...	...		
					Anglers,	1	14	1	11	...	...		
					Dragonet,	3	7	...	...	...	...		
					Pogge,	2	4½	...	...	...	...		
STATION III. 22nd Sept. 1892. 11.12 a.m. to 1.30 p.m.	E. 53·0	11·1	11·3 7 fath.	Surface Tow-net.—*Hyperia*, sp. r.; *Acartia longiremis*, f.; Ctenophora, fr.; *Aurelia*, r.; young Crustacea, fr. Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.;	Thornback rays,	1	21	1	20	1	18	*Eledon cirrhosa*, r.; *Pecten opercularis*, ab.; *Cancer pagurus*, r.; *Portunus depurator* and *holsatus*, fr.; *Nephrops nor-*	At beginning — Wind E.; force 2; weather, moderately clear; sea, slight; tide, 1½ hours flood; barometer, 30·31; transparency, 3½ fathoms.
					,, ,,	1	17	...	...	...	...		
					Plaice,	2	14–16	6	13	11	10–11		
					,,	2	9	...	...	...	...		
					Lemon soles,	5	12–13	22	10–11	12	8		
	W. 54·0	11·3	11·3 10½ fath.		,, ,,	15	6	...	...	...	...		
					Common dabs,	9	9–10	15	7–8	11	6		
					,, ,,	17	3–4	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 22nd Sept. 1892. 11.12 a.m. to 1.30 p.m. —*continued.*				*Sagitta*, ab.; youn Crustacea, fr.	Long rough dabs,	4	10	8	9	11	7	*vegicus*, fr.; *Ophiothrix rosula*, fr.; *Solaster papposa*, f.; *Echinus esculentus*, f.; *Chalina*, f.; *Actinidæ* and *Alcyonium*, r.	At finish—Wind E., force 3; weather and sea as before; tide, 4¼ hours flood; barometer, 30·30; transparency, 3 fathoms.
					,, ,, ,,	9	5	...	...	...	...		
					Brill,	1	16	...	...	...	...		
					Haddocks,	20	4–5	...	...	...	...		
					Cod,	2	14–16	10	13	6	12		
					,,	2	4	...	...	...	...		
					Whitings,	3	11	18	10	10	8		
					,,	8	4–5	...	...	...	...		
					Ling,	1	18	...	...	...	...		
					Hake,	3	10	1	9	1	8		
					Gurnards,	1	12	13	8–9	3	6		
					,,	11	4	...	...	...	...		
					Angler,	1	16	...	...	...	...		
					Dragonet,	1	9	...	...	...	...		
STATION IV. 20th Sept. 1892. 12.40 p.m. to 3.45	E. 52·0 W. 53·0	11·2 11·3	1·5 9 fath. 11·4 5 fath.	Surface Tow-net. — *Hyperia*, f.; young Crustacea and Infusoria, fr. Bottom Tow-net fixed to head of beam trawl.—*Calanus finmarchicus*, fr.; *Acartia*, sp. fr.; *Pseudocalanus elongatus*, f.; *Temora longicornis*, f.; *Centropages*, sp. f.; *Monstrilla*, sp. r.; *Caligus*, sp. r.; *Sagitta*, f.; young Crustacea, c.; young starfish and Annelides, f.	Thornback ray,	1	10	...	...	...	...	*Portunas depurator*, fr.; *Pecten opercularis*, v. ab.; *Asterias*, sp. f.; *Aurelia* and *Cyanea*, f.; *Chalina*, fr.; and *Actinoloba*, r.	At beginning—Wind E., force 5; weather, dull; sea, moderate; tide, 4½ hours flood; barometer, 30·11; transparency, 2 fathoms. At finish—Wind E.; force 6; weather as before; sea, rough; tide, 1½ hours ebb; barometer 30·14; transparency, 9½ fathoms.
					Plaice,	1	17	2	14	3	11–12		
					,,	10	7–9	...	...	...	...		
					Common dabs,	1	5	...	...	...	...		
					Cod,	1	21	1	13	...	...		
					Whitings,	1	8	1	5	...	...		
					Gurnards,	1	6	1	3	...	...		
					Angler,	1	14	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION V. 14th Sept. 1892. 6.10 a.m. to 8.10 a.m.	E. 51·0	11·4	11·4 25 fath.	Surface Tow-net. — Ctenophora, c.; young Crustacea, ab. Bottom Tow-net. — *Mysis*, sp. r.; *Erythrops*, sp. f.; *Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Caligus*, r.; *Sagitta*, very ab.; Ctenophora, fr.; young Crustacea, fr.; post-larval fish, fr.	Grey skate,	1	15	...	...	...	...	*Loligo*, f.; *Hyas araneus*, r.; *Nephrops norvegicus*, ab.; *Asterias*, f.; *Cyanea* and *Aurelia*, f.	At beginning — Wind W., force 4; weather, dull; sea, easterly swell; tide, 4¼ hours flood; barometer, 29·90; transparency, 7 fathoms. At finish—Wind W.S.W., force 5; weather, dull; sea, moderate; tide, high water; barometer, 29·90; transparency, 7 fathoms.
					Thornback ray,	1	24	...	...	...	...		
					Plaice,	2	20–21	11	16–17	17	13		
	W. 52·7	11·4	11·6 29½ fath.		,,	13	11	...	...	...	...		
					Lemon soles,	1	13	2	11	3	10		
					Common dabs,	1	11	4	7–8	3	6		
					,, ,,	1	4	...	...	...	...		
					Flounder,	1	8	...	...	...	...		
					Long rough dabs,	1	10	64	8–9	67	7		
					,, ,,	56	5–6	...	...	...	...		
					Witch soles,	1	13	...	...	...	...		
					Haddocks,	12	10	15	9	1	8		
					,,	40	4–5	...	...	...	...		
					Whitings,	15	11–10	27	8	14	7		
					,,	28	4–5	...	...	...	...		
					Gurnards,	4	12–13	2	11	3	9		
					,,	1	5	...	...	...	...		
STATION VI. 14th Sept. 8.55 p.m. to 10.50 a.m.	W. 51·0	11·4	11·7 12 fath.	Surface Tow-net. — *Hyperia*, sp. f.; Ctenophora, fr.; young Crustacea, ab. Bottom Tow-net.—*Kröyera*, sp. r.; *Atylus bispinosus*, r.; *Calanus finmarchicus*, f.; *Sagitta*, f.; young Crustacea, f.	Plaice,	2	21–24	14	17–18	32	16	*Loligo*, r.; *Eupagurus*, r.; *Astropecten irregularis*, r.; *Solaster endeca*, fr.; *Asterias*, f.; *Echinus esculentus*, r.; *Alcyonium*, f.; *Aurelia*, c.	At beginning — Wind W.S.W., force 5; weather, dull; sea, moderate; tide, 1 hour ebb; barometer, 29·91; transparency, 4½ fathoms. At finish—Wind W.S.W., force 7;
					,,	45	10–15	...	...	...	...		
					Lemon soles,	1	13	4	12	7	9–10		
					,, ,,	1	6	...	...	...	...		
	E. 54·0	11·4	11·6 14 fath.		Common dabs,	7	9–10	45	7–8	34	6		
					,, ,,	31	5	...	...	...	...		
					Haddocks,	1	16	1	12	3	10		
					,,	7	8–9	...	...	...	...		
					Cod,	1	14	2	12	6	11		
					,,	3	10	...	...	...	...		
					Whitings,	2	10	1	8	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station VI. 14th Sept. 1892. 8.55 a.m. to 10.50 a.m. —*continued.*					Gurnards,	3	13	1	11	10	8–9		weather, dull; sea, choppy; tide, 3 hours ebb, barometer, 29·91; transparency, 6 fathoms.
					,,	26	6–7	...	...	...	...		
					Anglers,	1	26	2	23	2	18		
					,, ,,	2	11–14	...	...	...	...		
					Dragonet,	1	7	...	...	...	...		
Station VII. 14th Sept. 1892. 11.20 a.m. to 12.55 p.m.	W. 52·5 E. 56·0	11·4 11·4	11·7 fath. 11·7 fath.	Surface Tow-net.—Young Crustacea, f. Bottom Tow-net.—Contained a quantity of mud and sand.	Plaice,	2	11	3	10	2	9	*Ascidia*, sp. fr.; *Portunus holsatus*, c.; *Eupagurus*, f.; *Asterias*, fr.; *Astropectin irregularis*, r.; *Luidia sarsi*, r.; *Solaster endeca*, r.	At beginning — Wind W.S.W., force 5; weather, dull; sea, moderate, somewhat choppy, tide, 3½ hours ebb; barometer, 29·91; transparency, 3½ fathoms. At finish—Wind W.S.W., force 7; weather, dull; sea choppy; tide, 5 hours ebb, barometer, 29·91; transparency, 4 fathoms.
					Lemon soles,	1	12	2	9	2	8		
					Common dabs,	6	8–9	30	7	22	5		
					,, ,,	114	3½–4	...	...	...	...		
					Turbot,	1	20	...	...	...	...		
					Haddocks,	1	11	2	10	5	9		
					,,	45	4–5	...	...	...	...		
					Whitings,	2	8	2	7	2	6		
					,,	1	4	...	...	...	...		
					Gurnards,	1	11	1	9	16	6–7		
					,,	51	4–5	...	...	...	...		
					Dragonets,	1	8	2	6	...	...		
Station VIII. 13th Sept. 1892. 12.15 p.m. to 2.15 p.m.	S.W. 56·5 N.E. 55·0	11·5 11·7	11·3 20½ h. 11·9 29 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Sagitta*, fr.; Ctenophora, f.; young Crustacea, ab.; post-larval fish, f. Bottom Tow-net.—*Erythrops*, sp. f.; *Mysis*, sp. r.;	Long rough dabs,	2	7	...	...	...	..	*Fusus antiquus*, v. r.; *Aurelia* (associated with which were a few *Hyperia*, sp.), abundant.	At beginning—Wind N., squally, weather; dull; sea; moderate, tide, 5 hours ebb; barometer, 29·55; transparency, 4½ fathoms. At finish —Wind
					Haddock,	1	5	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VIII. 13th Sept. 1892. 12.15 p.m. to 2.15 p.m. —*continued.*				*Cumacea*, several; small Amphipods, f.; *Calanus finmarchicus*, fr.; *Temora longicornis*, fr.; *Sagitta*, c.; Ctenophora, f.; young Crustacea, f.; a. small quantity of mud.									N.N.E., force 4; weather, sea as before; tide, ¾ hour flood; barometer, 29·63; transparency, 7 fathoms.
STATION IX. 12th Sept. 1892. 2.55 p.m. to 5.5 p.m.	N.W. 54·5	11·8	11·7 30 fath.	Surface Tow-net. — *Calanus finmarchicus*, f.; young Crustacea, ab.; young *Aurelia*, r. Bottom Tow-net. — *Calanus finmarchicus*, f.; *Pseudocalanus elongatus*, fr.; *Temora longicornis*, f.; *Sagitta*, ab.; young Crustacea (Brachyura Schizopoda), fr.; post-larval fish, f.	Grey skates,	1	38	...	...	...	...	*Fusus antiquus*, r.; *Eupagurus bernhardus*, r.; *Nephrops norvegicus*, ab.; *Asterias*, f.; *Cyanea* and *Aurelia*, f.	At beginning — Wind N.N.E., force 4; weather, dull; sea, moderate, north easterly swell; tide, 1¾ hours flood; barometer, 29·65; transparency, 7 fathoms. At finish – Wind, weather, sea, as before; tide, 3¾ hours flood; barometer, 29·75; transparency, 8 fathoms.
					Starry rays,	3	10	...	...	...	...		
					Common dabs,	2	8	3	7	4	6		
					,, ,,	2	4	...	...	...	...		
	S.E. 52·0	11·9	11·2 32 fath.		Long rough dabs,	4	9–10	21	8	53	7		
					,, ,,	90	5	...	...	...	...		
					Witch soles,	1	18	1	15	...	...		
					Haddocks,	1	13	44	9–10	31	7–8		
					,,	114	4–5	...	...	...	...		
					Cod,	1	10	...	...	...	...		
					Whitings,	3	10	25	8–9	4	7		
					,,	43	4–5	...	...	...	...		
					Hake,	1	36	...	...	...	...		
					Gurnards,	3	12	13	10-11	16	7–8		
					,,	18	4–6	...	...	...	...		
					Three-bearded rockling,	1	7	...	...	...	...		
					Pogge,	2	3½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Surface Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION O. (Limekilnes Station). 13th Oct. 1892. 12.40 p. m. to 1.40 p.m.	W. 50·5 E. 49·5	9·2 9·0	9·8 7½ fath. 10·0 9½ fath.	Surface Tow-net. — *Macropsis slabberi*, f.; *Acartia*, sp. f.; young Crustacea, f. Bottom Tow-net.—*Pandalus annulicornis*, f.; *Crangon*, sp. f.; *Mysis* (*flexuosus*, *ornatus*, *spiritus*), c.; *Gastrosaccus*. f.; *Macropsis*, fr.; *Caligus*, sp. f.; young Crustacea, f.	Thornback rays, .	1	16	1	14	3	9–11	*Hyas coarctatus*, and *araneus*, f.; *Carcinus*, r.; *Portunus*, sp. (*holsatus* mostly), *Eupagurus bernhardus*; f.; *Pandalus annulicornis*, fr.; *Asterias*, fr.; *Garveia?* f.; *Aphrodite*, f.; a considerable quantity of mud and rubbish.	At beginning — Wind N.E.; force 3; weather, dull; sea, slight; tide, 4¾ hours ebb; barometer, 30·14; transparency, 1 fathom. At finish — Wind N.E.; force 3; weather, dull; sea, smooth; tide, 5¾ hours ebb; barometer, 30·14; transparency, ¾ fathom.
					,, ,, .	2	4½	...	...	...	...		
					Lemon soles, .	1	9	1	8	...	...		
					Cod, . . .	1	21	1	15	1	12		
					,, . . .	4	4	...	...	...	...		
					Whitings, . .	10	10–12	8	8–9	4	7		
					,, . .	87	3½–5½	...	...	...	...		
					Liparis, sp. .	1	3½	...	...	...	. .		
STATION I. 21st Oct. 1892. 2.55 p.m. to 4.35 p.m.	W. 46·0 E. 46·0	8·9 9·0	9·3 13 fath. 9·3 16¾ fath.	Surface Tow-net.—*Hyperoche*, sp. r.; Ctenophora, fr.; young Crustacea, fr. Bottom Tow-net.—Touched bottom and came up damaged and partly filled with mud.	Thornback ray, .	1	11½	...	...	...	...	*Buccinum undatum*, f.; *Pecten opercularis*, f.; *Mytilus modiolus*, f.; *Loligo*, r.; *Cancer pagurus*, r.; *Nephrops norvegicus*, c.; *Asterias*, f.; *Solaster endeca* and *papposa*, r.	At beginning — Wind N., force 5; weather, dull; sea, north easterly swell; tide, near high water; barometer, 29·62; transparency, 2½ fathoms. At finish—Wind N. by E., force 6; weather, showery; sea, north easterly swell; tide, 1½ hour ebb; barometer, 29·62; transparency, 3 fathoms.
					Plaice, . .	1	17	1	15	1	12		
					,, . .	1	11	...	...	...	...		
					Lemon soles, .	3	12	3	10	1	9		
					,, ,, .	1	8	...	...	...	...		
					Common dabs, .	1	9	2	8	1	7		
					,, ,, .	1	5½	...	...	...	...		
					Long rough dabs,	1	12	6	8½	7	7½		
					,, ,, .	4	4	...	...	...	...		
					Haddocks, . .	1	10	7	5½	...	..		
					Cod, . . .	1	24	1	20	6	12–13		
					,, . . .	8	3½–5½	...	...	...	...		
					Whitings, . .	2	9	4	8	159	4–7		
					Gurnard, . .	1	15½	...	...	...	...		
					Anglers, . .	1	28	1	23	1	21		
					,, . .	1	11	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station II. 22nd Oct. 1892. 11.30 a.m. to 12.55 p.m.	E. 43·0 W. 45·0	9·1 9·0	9·3 13½ fath. 9·2 13½ fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Acartia longiremis*, f.; *Temora longicornis*, f.; Ctenophora, f.; young Crustacea, f. No bottom Tow-net.	Plaice,	5	13–14	17	11	7	12	*Cancer pagurus*, f.; *Eledon cirrhosa*, 1; *Asterias*, f.; *Solaster papposa*, f.; *Alcyonium*, f.	At beginning — Wind W., force 4; weather, moderately clear; sea, moderate; tide, 2¼ hours flood; barometer, 29·61; transparency, 3¾ fathoms. At finish—Wind N., force 5; weather and sea as before; tide, 3¾ hours flood; barometer, 29·59; transparency, 3 fathoms.
					,,	4	10	...	...	...	...		
					Lemon soles,	1	14	2	12	1	7½		
					Common dabs,	4	9–10	19	8	33	7		
					,, ,,	22	5–6	...	...	...	...		
					Long rough dabs,	6	10	3	9½	11	7½–8½		
					,, ,,	1	6	...	...	...	...		
					Haddocks,	90	4½–6	...	...	...	...		
					Whitings,	1	11	1	10	7	8		
					,,	50	5–6	...	...	...	...		
					Gurnards,	1	17	1	13	4	12		
					,,	9	6	...	...	...	...		
Station III. 21st Oct. 1892. 11.35 a.m. to 2.10 p.m.	E. 48·5 W. 46·0	8·6 8·9	8·8 8½ fath. 9·3 8½ fath.	Surface Tow-net.—*Hyperoche*, sp. f.; *Parathemisto*, sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; Ctenophora, fr.; young Crustacea, c. Bottom Tow-net.—Touched bottom and came up damaged and partly filled with mud and broken shells.	Lemon sole,	1	13	1	12	...	...	*Buccinum undatum*, fr.; *Fusus antiquus*, f.; *Pecten opercularis*, ab. (many dead shells); *Mytilus modiolus*, f.; *Asterias*, f.; *Solaster papposa*, f.; *Portunus holsatus*, f.; *Echinus esculentus*, f.; *Alcyonium*, f.	At beginning — Wind N., force 3; weather, dull; sea, slight; tide, 3 hours flood; barometer, 29·65; transparency, 2 fathoms. At finish — Wind N., force 4; weather and sea as before; tide, 5½ hours flood; barometer, 29·62; transparency, 3 fathoms.
					Common dabs,	1	10	...	...	...	...		
					Long rough dabs,	2	11	4	6	1	5		
					Haddocks,	5	6	10	5	...	...		
					Cod,	3	4½	...	...	...	...		
					Whitings,	27	5½	27	4½	...	...		
					Gurnard,	1	9	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 26th Oct. 1892. 12.50 p.m. to 3.35 p.m.	E. 44·0	7·2	7·8 8 fath.	Surface Tow-net. — *Calanus finmarchicus*, f.; *Acartia longiremis*, fr.; *Temora longicornis*, f.; young Crustacea, f. Bottom Tow-net.—*Hyperoche*, sp. f.; *Calanus finmarchicus*, f.; *Acartia longiremis*, fr.; *Temora longicornis*, fr.; *Sagitta*, c.; young Crusta-fr.; Infusoria, fr.	Plaice,	2	17	13	14	123	11–13	*Pecten opercularis*, ab.; *Mytilus modiolus*, f.; *Portunus depurator* and *holsatus*, fr.; *Hyas araneus*, f.; *Solaster endeca*, f.; *Chalina*, fr.	At beginning—Wind W.S.W., force 3 weather, hazy; sea, slight; tide, 1¾ hours flood; barometer, 29·96; transparency, 2 fathoms. At finish—Wind S.W., force 1; weather as before; sea, smooth; tide, 4½ hours flood; barometer, 29·92; transparency, 2 fathoms.
					„	9	9–10	...	...	...	...		
					Lemon soles,	4	12	1	7	...	...		
					Common dabs,	8	12–13	11	9–10	6	8		
	W. 45·0	7·4	7·8 6½ fath.		„ „	14	6–7	...	...	...	...		
					Long rough dabs,	1	9	1	8	...	...		
					Haddocks,	2	5	...	...	...	...		
					Cod,	2	28½	8	22–25	1	14		
					„	1	4	...	...	...	...		
					Whitings,	1	10	3	7	7	5		
					Pogge,	1	2½	...	...	...	...		
STATION V. 24th Oct. 1892. 12.55 p.m. to 2.50 p.m.	E. 46·0	9·0	9·6 23 fath.	Surface Tow-net. — *Parathemisto*, sp. fr.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, r.; *Temora longicornis*, r.; *Acartia longiremis*, f.; Infusoria, fr. Bottom Tow-net.—*Thysanoessa*, sp. fr.; *Parathemisto*, sp. f.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, c.; *Temora longicornis*, c.; *Caligus rapax*, f.; *Sagitta*, ab.: *Tomopteris*, fr.; post-larval fish, f.	Grey skate,	1	16	...	...	...	...	*Nephrops norvegicus*, ab.; *Alcyonium*, f.	At beginning — Wind N., force 3; weather, clear; sea, easterly swell; tide, 2¾ hours flood; barometer, 29·77; transparency, 3½ fathoms. At finish—Wind N.E. by N., force 3; weather and sea as before; tide, 4¾ hours flood; barometer, 29·79; transparency, 3½ fathoms.
					Thornback ray,	1	17	...	...	...	...		
					Plaice,	1	13½	1	12	...	...		
					Common dab,	1	4	...	...	...	...		
					Witch soles,	1	19	1	18	1	17		
	W. 46·0	9·0	9·6 30 fath.		Long rough dabs,	2	9½	5	8½	1	6		
					Haddocks,	1	14	1	11	2	9½		
					„	125	4–6	...	...	...	...		
					Cod,	1	36	2	22–24	3	11–14		
					„	5	4–6	...	...	...	...		
					Whitings,	1	9	1	8	121	4–6½		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 24th Oct. 1892. 10.40 a.m. to 11.45 a.m.	W. 42·5	8·8	9·1 13 fath.	Surface Tow-net.—*Temora longicornis,* f.; Ctenophora, f., young. Bottom Tow-net. —*Hyperoche,* sp. f.; *Calanus finmarchicus,* f.; *Temora longicornis* c.; *Caligus,* sp. f.; *Sagitta,* ab.; Ctenophora, fr.; young Crustacea, f.; young fish, r.	Plaice,	3	19-20	32	14-16	45	10-11	*Eledon cirrhosa,* r.; *Loligo vulgaris,* f.; *Solaster endeca,* f.	At beginning – Wind N. by W., force 3; weather, clear; sea, easterly swell; tide, ½ hour flood; barometer, 29·77; transparency, 3½ fathoms. At finish—Wind N.N.W., force 3; weather and sea as before; tide, 1½ hour flood; barometer, 29·77; transparency, 2½ fathoms.
					Lemon soles,	8	13-14	7	11	5	9		
					,, ,,	2	7	...	...	...	...		
					Common dabs,	6	8-10	4	7	5	6		
	E. 43·0	9·0	9·5 19 fath.		,, ,,	3	4½	...	...	...	...		
					Brill,	1	21½	...	...	...	..		
					Haddocks,	1	18	8	6	...	...		
					Cod,	3	15	4	14	3	12		
					,,	1	6	..	...	...	...		
					Whitings,	3	10	6	5–6	...	...		
					Gurnards,	1	14	1	13	1	12		
					,,	1	11	...	...	...	...		
					Anglers,	1	31	1	19½	...	...		
STATION VII. 1892. 26th Oct. 9.55 a.m. to 12 noon.	E. 37·0	8·0	9·4 17¼ fath.	Surface Tow-net.—*Parathemisto,* sp. f.; young Crustacea, f. Bottom Tow-net. — *Pseudocuma cercaria,* f.; *Calanus finmarchicus,* f.; *Pseudocalanus elongatus,* f.; *Acartia longiremis,* fr.; *Temora longicornis,* ab.; *Parapontella brevicornis,* fr.; *Caligus rapax,* f.; *Sa-*	Thornback rays,	1	10½	1	5	...	...	*Buccinum undatum,* f.; *Eledon cirrhosa,* r.; *Portunus depurator* and *holsatus,* f.; *Cancer pagurus,* f.; *Nephrops norvegicus,* f.; *Asterias,* ab.; *Solaster endeca,* c.; *Solaster papposa,* r.; *Luidia sarsi,* f.; *Astropecten irre-*	At beginning — Wind W., force 3; weather, hazy; sea, slight; tide, 5 hours ebb; barometer, 29·87; transparency, 2¾ fathoms. At finish—Wind W.S.W., force 2; weather and sea as before; tide, 1 hour
					Plaice,	2	17	2	16	8	14–15		
					,,	6	12-13½	...	...	...	...		
					Lemon soles,	1	14½	1	11½	1	8½		
					Common dabs,	3	9	2	8	4	7		
	W. 43·0	7·0	8·8 11 fath.		,, ,,	1	5	...	...	...	...		
					Witch soles,	3	18	1	16	...	...		
					Long rough dabs,	20	8	6	7	4	6		
					,, ,,	3	9	...	...	...	...		
					Haddocks,	2	14	2	9	228	5½–7½		
					Cod,	2	5½	2	3	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station VII. 26th Oct. 1892. 9.55 a.m. to 12.0 noon. —*continued.*				*gitta*, c.; *Tomopteris*, fr.; young Crustacea, f.; young Gastropods, f.	Whitings,	2	9	68	4½–6½	...	...	*gularis*, f.; *Echinus esculentus*, f.; *Actinoloba dianthus*, r.; *Ascidians*, fr.; Zoophytes, f.	flood; barometer, 29·96; transparency, 2 fathoms.
					Gurnards,	2	7	1	4	...	...		
					Angler,	1	12½	...	...	...	...		
					Ling,	1	28½	...	...	...	...		
					Dragonet,	1	7	...	...	...	...		
Station VIII. 25th Oct. 1892. 11.10 a.m. to 1.10 p.m.	S.W. 45·0	8·0	9·4 21 fath.	Surface Tow-net.—*Parathemisto*, sp. fr.; *Hyperoche*, sp. f.; *Acartia longiremis*, f.	Grey skates,	1	20	1	14½	...	...	*Eledon cirrhosa*, r.; *Portunus depurator*, r.; *Nephrops norvegicus*, ab.; *Asterias*, f.; *Solaster endeca*, r.; *Alcyonium*, f.; *Flustra*, r.	At beginning—Wind W. by N., force 2; weather, clear; sea, north easterly swell; tide, ½ hour flood; barometer; 29·88; transparency, 3 fathoms. At finish—Wind N.W., force 2; weather and sea as before; tide, 2½ hours flood; barometer, 29·87; transparency, 4¼ fathoms.
					Thornback ray,	1	17½	...	...	...	...		
					Starry rays,	1	11	1	9	...	...		
					Plaice,	1	23	2	16	...	...		
	N.E. 46·0	8·9	9·8 28½ fath.	Bottom Tow-net.—*Thysanoessa*, sp. r.; *Atylus bispinosus*, f.; *Calanus finmarchicus*, fr.; *Temora longicornis*, ab.; *Caligus*, sp. f.; *Sagitta*, c.; Ctenophora, f.	Lemon soles,	1	14½	1	13	...	...		
					Common dabs,	3	7	...	...	...	...		
					Witch soles,	1	18½	1	18	...	...		
					Long rough dabs,	3	9	25	8	15	7		
					,, ,,	8	6	...	...	...	...		
					Turbot,	1	28	...	...	...	...		
					Haddocks,	4	13–14	1	11	5	10		
					,,	142	5–6½	...	...	...	...		
					Cod,	2	33–38	3	24–31	3	13–16		
					,,	1	5	...	..	...	...		
					Whitings,	1	10	2	8	37	4½–6½		
					Brassie,	1	6	...	...	...	...		
					Gurnard,	1	14	...	...	...	...		
					Anglers,	1	19	1	14½	1	11		
					Dragonet,	2	6	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IX. 25th Oct. 1892. 1.55 p.m. to 4.0 p.m.	N.W. 42·0 S.E. 43·0	9·3 9·3	10·0 29 fath. 9·8 33 fath.	Surface Tow-net. — *Parathemisto*, sp. f.; *Calanus finmarchicus*, f.; Ctenophora, f. Bottom Tow-net. — *Hyperoche*, sp. r.; *Calanus finmarchicus*, c.; *Pseudocalanus elongatus*, f.; *Acartia longiremis*, fr.; *Temora longicornis*, c.; *Caligus*, f.; *Sagitta*, c.; Ctenophora, f.; young Crustacea, fr.; young Ophiurids, c.; young Lamellibranchs, f.	Long rough dabs,	2	8	...	...	...	...	A few *Nephrops norvegicus*.	At beginning—Wind N.W., force 2; weather, clear; sea, north easterly swell; tide, 3¼ hours flood; barometer, 29·86; transparency, 5 fathoms. At finish — Wind, weather and sea as before; tide, 5¼ hours flood; barometer, 29·86; transparency, 6 fathoms.
					Cod, . . .	1	6	...	...	...	...		
					Whitings, . .	3	5	...	...	...	...		
STATION I. 23r Nov. 1892. 11.20 p.m. to 4.10 p.m.	E. 46·0 W. 42·0	7·6 7·5	8·0 16 fath. 8·5 16 fath.	Surface Tow-net.—*Parathemisto*, sp. f.; *Caligus rapax*, r.; Ctenophora, fr.; young Crustacea, f. Bottom Tow-net.—*Crangon allmanni*, v.r.; *Thysanoessa*, f.; *Mysis*, sp. f.; *Erythrops*, sp. (*goesii ?*), fr.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, ab.; *Sagitta*, fr.; young Crustacea, fr.	Gray skates, .	1	16	1	8	...	...	*Pecten opercularis*, ab.; *Asterias*, c.; *Echinus esculentus*, c.	At beginning.—Wind S.W., force, light; weather, hazy; sea, smooth; tide, 2½ hours ebb; barometer, 30·23; transparency, 3 fathoms. At finish—Wind S.W., force, light; weather, sea, as before; tide 5¾ hours flood; barometer, 30·21; transparency, 2¾ fathoms.
					Thornback rays,	1	24	1	22	1	20		
					Plaice, . .	1	17	1	14	1	13		
					Lemon soles, .	16	12½	5	10	7	7		
					Common dabs, .	1	9½	1	8	4	7		
					Long rough dabs,	7	10	27	8–9	12	6		
					Haddocks, . .	1	14	2	7	...	...		
					Cod, . . .	1	27	5	24	3	19		
					,, . . .	33	12–16	3	9	8	6½		
					Whitings, . .	2	8	3	5	...	...		
					Brassie, . .	1	7	...	...	...	...		
					Gurnards, . .	1	14	1	7	...	...		
					Anglers, . .	1	19	1	3	1	25		
					Dragonet, . .	1	8	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 23rd Nov. 1892. 11.20 a.m. to 12.55 p.m.	E. 44·8	7·5	8·0 11 fath.	Surface Tow-net. — *Parathemisto*, sp. f.; *Calanus finmarchicus*, c.; Ctenophora, f.	Thornback ray, .	1	11½	...	...	...	...	*Pecten opercularis* r.; *Asterias*, r.; *Solaster papposa*, r.; *Actinoloba dianthus*, fr. *Alcyonium*, f.; Spongidæ, f.	At beginning—Wind S.E., force 2; weather, hazy; sea, smooth, with slight south easterly swell; tide, 1 hour flood; barometer, 30·28; transparency, 3½ fathoms. At finish — Wind southerly, force light; weather, hazy; sea smooth; tide, 2½ hours flood; barometer, 30·25; transparency, 2¾ fathoms.
					Plaice, . .	1	12	...	...	...	...		
					Common dabs, .	1	7¼	...	...	...	...		
	W. 45·0	7·5	8·8 13 fath.	Bottom Tow-net.—*Thysanoessa*, sp. r.; *Macropsis slabberi*, r.; *Parathemisto*, sp. r.; *Caprella*, sp. r.; *Calanus finmarchicus*, ab.; *Temora longicornis*, fr.; *Caligus rapax*, f.; *Sagitta*, c.; young Crustacea, fr.	Long rough dabs,	1	8½	1	6½	...	...		
					Haddock, . .	1	22	...	...	...	...		
					Cod, . . .	2	7	...	...	...	...		
					Whitings, . .	1	6½	1	6	1	5½		
STATION III. 22nd Nov. 1892. 2.45 p.m. to 4.45 p.m.	E. 46·0	7·8	8·2 8 fath	Surface Tow-net. — *Parathemisto*, sp. f.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, fr.; *Acartia longremis*, fr.; Ctenophora, fr.	Long rough dabs,	1	5	...	...	...	...	*Pecten opercularis*, f.; *Asterias*, f.; Zoophytes (*Flustra*, &c.), f.	At beginning—Wind E.S.E.; force 1; weather, hazy; sea, smooth; tide, 5 hours flood; barometer, 30·34; transparency, 2 fathoms. At finish — Wind weather, sea, as before; tide, ¾ hour ebb; barometer, 30·36; transparency, 2½ fathoms.
					Cod, . . .	1	12	1	6	...	...		
					Whitings, . .	2	6	...	...	...	...		
	W. 46·4	7·8	9·0 9½ fath.	Bottom Tow-net. — *Calanus finmarchicus*, fr.; *Pseudocalanus elongatus*, f.; *Acartia longiremis*, f.; *Sagitta*, c.; *Tomopteris*, r.; Ctenophora, f.									
STATION IV. 22nd Nov. 1892. 11.10 a.m. to 2.15 p.m.	W. 47·0	7·4	8·0 4 fath.	Surface Tow-net. — *Parathemisto*, f.; *Hyperoche*, sp. r.; *Mysis*, sp. r.; Ctenophora, c.	Plaice, . . .	1	19	6	17	99	12–14	*Pecten opercularis*, c.; *Solaster papposa*, r.; Spongidæ, f.	At beginning—Wind E.S.E., force 1; weather, hazy; sea, smooth; tide, 1½ hour flood; barometer,
					,, . .	38	9 11	...	...	...	...		
					Lemon soles, .	1	12	1	7	...	...		
				Bottom Tow-net.—*Hyper-*	Common dabs, .	7	10-11	11	7–8	7	5		
					Long rough dabs,	2	10	1	9	1	7		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 22nd Nov. 1892. 11.10 a.m. to 2.15 p.m. —*continued.*	E. 46·0	7·8	8.2 7 fath.	*oche*, sp. r.; *Calanus finmarchicus*, c.; *Pseudocalanus elongatus*, fr.; *Temora longicornis*, fr.; *Sagitta*, c.; young Crustacea, f.	Cod,	2	28	1	9	1	20½		30·38; transparency, 1½ fathom. At finish — Wind, weather, sea, as before; tide, 4½ hours flood; barometer, 30·34; transparency, 2 fathoms.
					Gurnard,	1	15	...	...	...	...		
					Angler fish,	1	18	1	13½	...	...		
STATION V. 24th Nov. 1892. 12.25 p.m. to 2.20 p.m.	E. 41·0 W. 41·0	8·2 7·9	8·4 23½ fath. 8·6 30 fath.	Surface Tow-net.—*Parathemisto*, sp. f.; *Calanus finmarchicus*, fr.; *Caligus rapax*, r.; *Sagitta*, f.; Ctenophora, f.; young Crustacea, f. Bottom Tow-net. — *Thysanoessa*, f.; *Mysis*, f.; *Stenothœ*, sp. r.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, c.; *Caligus rapax*, fr.; *Sagitta*, ab.; *Tomopteris*, f.; Ctenophora, fr.; young Gastropoda, fr.; young Crustacea, fr.; young Ophiurids, fr.	Plaice,	1	13½	...	...	...	...	*Pecten opercularis*, f.; *Nephrops norvegicus*, f.; very little in net.	At beginning—Wind N.W., force, light, weather, hazy; sea, smooth; tide, 1½ hour flood; barometer, 30·13; transparency, 5 fathoms. At finish — Wind, weather, sea, as before; tide, 3½ hours flood; barometer, 30·11; transparency, 5 fathoms.
					Lemon soles,	2	12¼	...	...	...	...		
					Common dab,	1	8	...	...	...	...		
					Long rough dabs,	2	10	4	9	5	8		
					,, ,,	4	7	...	...	...	...		
					Haddocks,	2	14½	2	16–18	2	11–13		
					,,	27	5½–6½	...	...	...	...		
					Cod,	1	15	2	13–14	4	11½–12½		
					,,	1	18	...	...	...	...		
					Whiting,	1	17	1	9	2	6		
					Brassy,	1	6	...	...	...	...		
STATION VI. 24th Nov. 1892. 2.50 p.m. to 3.45 p.m.	E. 40·8 W. 40·4	7·9 8·0	8·3 14½ fath. 8·3 14 fath.	Surface Tow-net. — *Parathemisto*, sp. f.; *Calanus finmarchicus*, f.; *Caligus rapax*, f.; *Sagitta*, f.; young Crustacea, f.; Ctenophora, fr. Bottom Tow-net. — *Parathemisto*, sp. f.; *Ampelisca*, sp. r.; *Calanus finmarchicus*,	Thornback ray,	1	4½	...	...	...	...	*Asterias*, f.; *Solaster endeca*, f.; a small quantity of weed.	At beginning—Wind N.W., force 2; weather, hazy; sea, slight; tide, 4 hours flood; barometer, 30·11; transparency, 5 fathoms. At finish — Wind weather, sea, as
					Plaice,	2	18–21	67	15–16	30	13–14		
					,,	9	11–12	...	...	...	...		
					Lemon soles,	4	14	1	12	2	11		
					Common dabs,	1	12	1	9	1	8		
					,, ,,	1	6	...	...	...	...		
					Long rough dabs,	1	10½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued*.

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 24th Nov. 1892. 2.50 p.m. to 3.45 p.m. —*continued*.				fr.; *Temora longicornis*, f.; *Caligus rapax*, r.; *Sagitta*, fr.; Ctenophora, c.; young Gastropoda, f.; young Crustacea, f.	Haddocks, . .	6	6	...	...	...	...		before; tide, fully 4¾ hours flood; barometer, 30·11; transparency, 5 fathoms.
					Cod, . . .	1	24	1	14	2	13		
					Whiting, . .	1	8	...	...	...	...		
					Gurnard, . .	1	10	...	...	...	...		
					Angler, . .	1	22	...	...	...	...		
STATION VII. 25th Nov. 1892. 10.55 p.m. to 12.50 p.m.	E. 43·5	7·8	8·7 16¾ fath.	Surface Tow-net.—*Euthemisto compressa*, f.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; *Sagitta*, f.; Ctenophora, f. Bottom Tow-net.—*Hyperia*, sp. r.; *Calanus finmarchicus*, c.; *Caligus rapax*, fr.; *Sagitta*, ab.; *Tomopteris*, f.; Ctenophora, fr.; young Crustacea, f.	Thornback ray, .	1	10	...	...	...	...	*Cancer pagurus*, f.; *Portunus holsatus*, f.; *Eupagurus bernhardus*, fr.; *Nephrops norvegicus*, r.; *Asterias*, fr.; *Solaster endeca*, c.; *Solaster papposa*, r.; *Astropecten irregularis*, r.; *Luidia sarsii*, r.; *Alcyonium*, c.; *Ascidia*, sp. fr.; some weed and Zoophyte.	At beginning—Wind S.E., force 4; weather, cloudy; sea, heavy south easterly swell; tide, 5¼ hours ebb; barometer, 30·18; transparency, 3½ fathoms. At finish — Wind S.S.E., force 4; weather, cloudy; sea as before; tide, ¾ hour flood; barometer, 20·17; transparency, 2¾ fathoms.
					Starry rays, .	2	12	...	...	...	...		
					Plaice, . .	1	17	1	14	...	...		
					Common dabs, .	1	9½	1	8½	...	..		
					Witch soles, .	5	18–19½	...	...	...	...		
	W. 47·0	7·6	8·3 10¾ fath.		Long rough dabs,	2	10–11	12	8–9½	4	6–7½		
					Cod, . . .	1	14	...	...	...	...		
					Haddocks, . .	1	15	3	13	3	10–11		
					,, . .	133	5½–6½	...	...	...	...		
					Whitings, . .	2	8	...	...	...	...		
					Gurnard, . .	1	4½	...	...	...	...		
STATION X. 26th Nov. 1892. 11.20 a.m. to 12.10 p.m.	W. 44·0	6·7	7·5 7 fath.	Surface Tow-net. — Young Crustacea, f.; a small quantity of weed. Bottom Tow-net.—Net had touched bottom and contained a considerable quantity of mud and dead shells.	Thornback ray, .	1	9	...	...	...	...	*Eolis*, sp. r.; *Carcinus mænas*, r.; *Hyas coarctatus*, r.; *Asterias*, f.; *Solaster endeca*, r.; *Anemones*, f.; a considerable quantity of mud.	At beginning—Wind calm, force 0; weather, hazy with rain; sea, smooth; tide, 4½ hours ebb; barometer, 29·83; transparency, ¾ fathom. At finish — Wind N.W., force, light; weather, sea as before; tide, 5 5/12 hours ebb; barometer, 29·83; transparency, ¾ fathom.
					Cod, . . .	1	5	...	...	...	...		
					Whitings, . .	1	10	1	8	6	6		
					Father-lasher, .	1	10	...	...	...	...		
	E. 44·8	6·7	7·9 9¾ fath.		*Liparis vulgaris*,	1	5	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net,	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station I. 16th Dec. 1892. 11.0 a.m. to	E. 44·0 W. 48·0	5·9 6·0	6·5 15 fath. 6·4 13 fath.	Surface Tow-net.—*Hyperoche*, sp. r.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, c.; *Caligus rapax*, f.; *Sagitta*, fr.; Ctenophora, f. Bottom Tow-net.—*Thysanoessa*, sp. f.; *Calanus finmarchicus*, c.; *Caligus rapax*, f.; *Sagitta*, fr.; Ctenophora, f.; *Tomopteris*, f.	Thornback rays,	3	19	1	16	2	11	*Pecten opercularis*, fr.; *Mytilus modiolus*, f.; *Nephrops norvegicus*, r.; *Asterias*, sp. fr.; *Solaster papposa* and *endeca*, fr.; *Actinoloba dianthus*, f.; *Alcyonium*, f.; Ascidians, f.	At beginning — Wind W.S.W., force 1; weather, slight haze; sea, slight; tide, 4 hours flood; barometer, 30·03; transparency, 3½ fathoms. At finish—Wind S.W., force 4; weather, as before; sea, choppy; tide, high water; barometer, 29·98; transparency, 3½ fathoms.
					,, ,,	1	8	...	...	...	...		
					Plaice, . .	1	14	...	...	...	...		
					Lemon soles, .	1	14	2	11	2	10		
					Common dabs, .	1	9	2	8	2	7		
					Long rough dabs,	2	11–12	23	9–10	21	8		
					,, ,,	12	5–6	...	...	...	...		
					Haddocks, . .	2	5	...	...	...	...		
					Cod, . . .	2	20	6	6–7	...	...		
					Whitings, . .	1	11	1	8	1	4		
					Ling, . . .	1	20	...	...	...	...		
					Anglers, . .	2	26	2	24	2	21–23		
					,, ,, .	3	15–19	...	...	...	...		
Station II. 22nd Dec. 1892. 2.20 p.m. to 4.5 p.m.	E. 42·5 W. 41·5	5·9 5·7	6·3 12 fath. 6·0 12½ fath.	Surface Tow-net—*Thysanoessa*, sp. f.; *Hyperia*, sp. r.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, f.; Ctenophora, fr. Bottom Tow-net.—*Thysanoessa*, sp., r.; *Calanus finmarchicus*, f.; *Sagitta*, sp. fr.; *Tomopteris*, f.; Ctenophora, f.	Plaice, , .	5	16	2	14	20	12	*Eupagurus bernhardus*, f.; *Asterias*, f.; *Solaster papposa*, fr.; *Echinus esculentus*, f.; *Alcyonium*, fr.	At beginning—Wind N.E., force 1; weather, fog; sea, smooth; tide, 4¼ hours flood; barometer, 30·0; transparency, 5 fath. At finish—Wind N. N.E., force 1; weather, fog; sea, smooth; tide, 5¾ hours flood; barometer, 30·01; transparency, 4 fathoms.
					,, . .	4	10	...	...	...	...		
					Lemon soles, .	2	13	...	...	...	...		
					Common dabs, .	1	9	2	7	1	6		
					,, ,, . .	1	5	...	...	...	...		
					Long rough dabs,	2	8	1	7	1	6		
					Haddocks, . .	4	6½–5	...	...	...	...		
					Whiting, . .	1	4½	...	...	...	...		
					Dragonet, . .	1	7	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 16th Dec. 1892. 1.10 p.m. to 3.30 p.m.	W. 47·0	6·2	6·5 8 fath.	Surface Tow-net.—*Parathemisto*, sp. f.; *Calanus finmarchicus*, fr.; *Sagitta*, f.; Ctenophora, f. Bottom Tow-net.—*Thysanoessa*, f.; *Calanus finmarchicus*, fr.; *Caligus rapax*, f.; *Sagitta*, fr.; *Tomopteris*, f.; Ctenophora, f.	Plaice,	1	15	3	14	1	12	*Pecten opercularis*, c.; *Fusus antiquus*, f.; *Buccinum undatum*, f.; *Asterias*, f.; *Solaster papposa*, fr.; *Echinus esculentus*, f.; *Alcyonium*, f.	At beginning — Wind S.W., force 4; weather, slight haze; sea, choppy; tide, ½ hour ebb; barometer, 29·97; transparency, 2¾ fathoms. At finish—Wind W.S.W., force 6; weather, dull; sea, as before; tide, 2½ hours flood; barometer, 29·92; transparency, 2¾ fathoms.
					,,	1	11	...	...	...	...		
					Lemon soles,	2	10	2	9	...	...		
					Common dabs,	2	11	2	9–10	2	7		
	E. 47·0	5·1	6·3 13 fath.		,, ,,	2	5–6	...	...	...	...		
					Long rough dabs,	1	10	10	9	7	8		
					,, ,, ,,	5	6–7	...	...	...	...		
					Cod,	2	23–24	2	20–22	2	16–18		
					,,	15	6–8	...	...	...	...		
					Whitings,	2	9	1	7	9	6		
					,,	3	4	...	...	...	...		
					Gurnard,	1	4	...	...	...	...		
					Ling,	1	20	...	...	...	...		
					Angler,	1	22	...	...	...	...		
STATION IV. 23rd Dec. 1892. 1.35 p.m. to 4.10 p.m.	E. 40·8	5·7	5·9 8¼ fath.	Surface-Tow net.—*Thysanoessa*, sp. r.; *Mysis vulgaris*, r.; *Hamathella sabina*, r.; *Hyperoche*, sp. f.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, f.; Ctenophora, f. Bottom-Tow net.—*Calanus finmarchicus*, f.; *Sagitta*, fr.; Ctenophora, f.	Plaice,	11	14–15	37	12	23	11	*Pecten opercularis*, ab.; *Mytilus modiolus*, fr.; *Buccinum undatum*, r.; *Asterias*, f.; *Solaster papposa*, f.; *Echinus esculentus*, f.	At beginning—Wind S.S.E., force 1; weather, hazy; sea, smooth; tide, 2½ hours flood; barometer, 30·08; transparency, 3 fathoms. At finish — Wind E.S.E., force 1; weather, hazy; sea, smooth; tide, about high water; barometer 30·06; transparency, 2 fathoms.
					,,	6	10	..	...	...	...		
					Lemon soles,	1	12	...	...	...	...		
					Common dabs,	4	12–13	6	9–10	2	8		
					,,	4	7	...	...	...	...		
					Long rough dabs,	2	8	1	7	...	...		
					Cod,	1	5	1	4	...	...		
	W. 38·8	5·7	6·0 6½ fath.		Whiting,	1	5	...	...	...	...		
					Herring,	1	4½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Sur-face.	Bot-tom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 19th Dec. 1.0 p.m. to 3.5 p.m.	E. 46·0	6·7	7·0 23 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Sagitta*, f.; Ctenophora, fr. Bottom Tow-net.—*Thysanoessa*, c.; *Mysis*, sp. f.; *Erythrops*, sp. f.; *Parathemisto*, sp. r.; *Calanus finmarchicus*, c.; *Caligus rapax*, f.; *Sagitta*, c.	Starry ray,	1	12	...	...	...	...	*Nephrops norvegicus*, fr.; *Fusus antiquus*, v. r.; *Asterias*, r.	At beginning—Wind W.S.W., force, light; weather, hazy; sea, smooth; tide, 4½ hours flood; barometer, 29·94; transparency, 5 fathoms. At finish — Wind F., force 3; weather, hazy, with rain; sea, slight; tide, ½ hour ebb; barometer, 29·95; transparency, 5 fathoms.
					Plaice,	1	22	2	15–17	1	14		
					,,	1	13	...	...	...	...		
					Common dabs,	1	9	3	8	...	...		
	W. 43·0	6·4	6·9 31 fath.		Witch soles,	1	19	1	18	3	16		
					Long rough dabs,	2	10–11	21	8–9	13	6–7		
					,,	2	5	...	...	...	...		
					Haddocks,	2	16–17	2	11–14	51	7–10		
					,,	40	5½–6½	...	...	...	...		
					Cod,	3	22–26	4	19–21	6	12–15		
					,,	3	4–5½	...	...	...	...		
					Whitings,	1	8½	1	6½	2	4½		
					Ling,	1	20	...	...	...	...		
STATION VI. 22nd Dec. 1892. 12.25 p.m. to 1.15 p.m.	E. 44·0	6·3	6·5 15 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Sagitta*, f.; Ctenophora, f.; *Pleurobrachia*, fr. Bottom Tow-net.—*Thysanoessa*, sp. r.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; *Sagitta*, fr.; young herring, 1 young starfish (Ophiurids), f.	Thornback ray,	1	12	...	...	...	...	*Cancer pagurus*, r.; *Nephrops norvegicus*, r.; *Asterias*, f.; *Solaster papposa* and *endeca*, r.; *Ophiothrix rosula*, r.; *Alcyonium*, f.; *Actinoloba dianthus*, f.	At beginning—Wind N.N.E., force 1; weather, slight fog; sea, smooth; tide, about 2½ hours flood; barometer, 30·0; transparency, 4 fathoms. At finish — Wind N.E., force 1; weather and sea as before; tide, 3¼ hours flood; barometer, 30·30; transparency, 4 fathoms.
					Starry ray,	1	11	...	...	...	...		
					Plaice,	1	2	2	15–16	4	12		
					,, ,,	2	11	...	...	...	...		
					Lemon soles,	2	15–16	5	13–14	3	12		
					,,	5	9–10	...	...	...	...		
	W. 43·0	6·2	6·7 20 fath.		Common dabs,	1	9	2	7	1	6		
					Long rough dabs,	1	9	1	8	6	7		
					Haddock,	1	12	1	10	24	7–5½		
					Cod,	2	19–22	3	17½	6	12–15		
					,,	6	6–7	...	...	...	...		
					Whitings,	2	5	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—I. Firth of Forth—*continued.*

Station, Date, and Time Trawl down	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station VII. 15th Dec. 1892. 12.35 p.m. to 2.20 p.m.	W. 43·8 E. 44·0	4·7 4·8	6·2 12½ fath. 5·8 17½ fath.	Surface Tow-net.—*Thysanoessa*, sp. f.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, fr.; *Sagitta*, r.; *Tomopteris*, r.; Ctenophora, f. Bottom Tow-net. — Euphausidæ (*Thysanoessa*, &c.), fr.; *Macropsis slabberi*, r.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, fr.; *Caligus rapax*, f.; *Sagitta*, ab.; *Tomopteris*, fr.; Ctenophora, fr.; young herring, r.	Common dabs,	4	8–8½	...	...	...	...	*Eledon cirrhosa*, 3; *Eupagurus bernhardus*, r.; *Galathea nexa*, r.; *Asterias*, fr.; *Solaster papposa* and *endeca*, f.	At beginning—Wind W., force 4; weather, slight haze; sea, moderate; tide, ½ hour ebb; barometer, 29·74; transparency, 2¾ fathoms. At finish — Wind, weather and sea, as before; tide, 2¼ hours ebb; barometer, 29·75; transparency, 3 fathoms.
					Long rough dabs,	1	9	6	8	1	6		
					Haddocks,	1	14	4	11	19	7		
					,,	57	6	...	...	...	...		
					Whitings,	1	7½	3	6	1	5		
					Brassie,	1	7	...	...	...	...		
Station VIII. 2nd Dec. 1892. 12.50 p.m. to 2.45 p.m.	S.W. 36·0 N.E. 34·8	6·9 7·5	7·9 23 fath. 8·5 28½ fath.	Surface Tow-net.—*Hyperoche*, sp. r.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, f.; *Sagitta*, f. Bottom Tow-net.—*Thysanoessa*, sp. c.; *Erythrops*, sp. r.; *Calanus finmarchicus*, fr.; *Sagitta*, c.; Ctenophora, fr.	Starry ray,	1	7¼	...	...	...	...	*Eledon cirrhosa*, 1; *Cancer pagurus*, 2 half grown; *Nephrops norvegicus*, ab.; *Asterias*, f.	At beginning—Wind W. by S., force 2; weather, hazy; sea, north easterly swell; tide, near high water; barometer, 30·06; transparency, 3½ fathoms. At finish — Wind, weather and sea, as before; tide, 1¾ hour ebb; barometer, 30·06; transparency, 5 fathoms.
					Common dab,	1	6	...	...	...	...		
					Witch soles,	2	15	...	...	...	...		
					Long rough dabs,	9	8–9½	11	7	4	6		
					,, ,,	7	5	...	...	...	...		
					Haddocks,	1	20	4	14½–16	2	13		
					,,	55	7–5	...	...	...	...		
					Cod,	1	39	1	36	1	29		
					,,	3	13½	...	...	...	...		
					Whitings,	2	8	1	7	2	5		
					Hake,	1	11	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature. Air. Dry Bulb.	Temperature. Water. Surface.	Temperature. Water. Bottom.	Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish. No.	Inches	No.	Inches	No.	Inches	Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
STATION VIII. 20th Dec. 1892. 12.40 p.m. to 2.35 p.m.	N.E. 42·5 S.W. 41·5	6·0 6·0	7·0 28 fath. 6·7 22 fath.	Surface Tow-net.—*Thysanoessa*, sp. r.; *Calanus finmarchicus*, v. r.; *Caligus rapax*, v. r.; *Sagitta*, v. r.; Ctenophora, v. r. Bottom Tow-net.—*Thysanoessa*, f.; *Mysis*, sp. f.; *Erythrops*, sp. f.; *Atylus*, sp. r.; *Ampelisca*, sp. r.; *Parathemisto*, f.; *Caligus finmarchicus*, fr.; *Caligus rapax*, f.; *Sagitta*, fr.	Grey skate,	1	12	...	...	...	...	*Nephrops norvegicus*, c.; *Alcyonium*, r.	At beginning—Wind S.S.E., force 2; weather, overcast; sea, easterly swell; tide, 3¼ hours flood nearly; barometer, 30·03; transparency, 6½ fathoms. At finish — Wind, weather, and sea as before; tide, 5¾ hours flood; barometer, 30·04; transparency, 4½ fathoms.
					Common dabs,	2	8	...	...	...	...		
					Witch soles,	1	17	1	15	...	...		
					Long rough dabs,	2	9	2	8	26	7		
					,, ,, ,,	4	6	...	...	...	...		
					Haddocks,	1	16	2	13	15	17		
					,,	35	5-6	...	...	...	...		
					Cod,	1	20	1	17	...	...		
					Whitings,	1	7	3	6	...	...		
STATION IX. 2nd Dec. 1892. 3.20 p.m. to 5.20 p.m.	N.W. 35·0 S.E. 36·5	7·5 8·0	8·5 30 fath. 8·3 34 fath.	Surface Tow-net.—*Hyperoche*, sp. f.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, fr.; *Sagitta*, fr.; young Crustacea, f. Bottom Tow-net.—*Thysanoessa*, sp. fr.; *Mysis*, sp. r.; *Calanus finmarchicus*, c.; *Calisoma*, sp. r.; young Ophiurids, fr.; Ctenophora, f.	Plaice,	1	23	1	19	...	...	*Nephrops norvegicus*, c.	At beginning—Wind W. by N., force 2; weather, hazy; sea, north easterly swell; tide, 2¼ hours ebb; barometer, 30·06; transparency, 5 fathoms. At finish — Wind S.W., force 3; weather and sea as before; tide, 4¼ hours ebb; barometer, 30·05; transparency (too dark to see).
					Long rough dabs,	2	10-11	13	8-9	24	7		
					,, ,,	12	6	...	...	...	...		
					Haddocks,	1	12	99	5-6	...	...		
					Cod,	1	31	1	28	1	21		
					,,	3	12	...	...	...	...		
					Whitings,	1	11	1	9	7	7		
					Angler,	1	13	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—I. FIRTH OF FORTH—*continued.*

Station, Date, and Time Trawl down.	Temperature. Air.	Temperature. Water.		Pelagic Fauna, Spawn and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IX.* 22nd Dec. 1892. 8.15 a.m. to 10.20 a.m.	E. 43·0 W. 43·5	6·4 6·2	7·5 33 fath. 7·1 32½ fath.	Surface Tow-net. — *Parathemisto*, r.; *Sagitta*, f.; Ctenophora, f.; fish ova (Plaice ?), r. Bottom Tow-net.—*Spirialis retroversus*, r.; *Thysanoessa*, sp. f.; *Mysis lamornæ*, *Mysis*, sp. and *Erythrops*, r.; *Cumacea*, f.; *Parathemisto*, r.; *Monoculodes longimanus*, f.; *Calanus finmarchicus*, fr.; *Caligus rapax*, f.; *Temora longicaudata*, r.; *Sagitta*, c.; *Tomopteris*, f.; Ctenophora, fr.	Thornback ray, .	1	14	...	...	...	...	*Buccinum undatum*, r.; *Nephrops norvegicus*, c.; *Asterias*, f.; *Solaster papposa* and *endeca*, f.	At beginning — Wind S.S.E., force 1; weather, dull; sea, slight easterly swell; tide, 4¼ hours ebb; barometer, 30·0; transparency, 7½ fathoms. At finish—Wind, weather and sea as before; tide, shortly after low water; barometer, 30·0; transparency, 7 fathoms.
					Starry rays, .	1	11	1	7	...	...		
					Lemon soles, .	1	11	...	...	...	...		
					Common dabs, .	2	8–9	2	7	3	6		
					,, ,, .	2	5	...	...	...	...		
					Witch soles, .	1	11	...	...	...	...		
					Long rough dabs,	2	9	20	8	12	7		
					,, ,,	10	6	...	...	...	...		
					Haddocks, . .	2	11	1	7	123	5–6		
					Cod, . . .	1	20	1	17	2	14		
					Whitings, . .	1	5	3	4	...	...		
					Brassie, . .	1	6	...	...	...	...		
					Four-bearded rockling, . .	1	10½	...	...	...	...		
STATION X. 24th Dec. 1892. 10.55 a.m. to 12.55 a.m.	E. 32·0 W. 34·0	5·3 4·5	5·6 7 fath. 5·2 5½ fath.	Surface Tow-net.—*Macropsis slabberi*, fr.; young Crustacea, f. Bottom Tow-net.—*Macropsis slabberi*, fr.; *Mysis*, sp. fr.; *Calanus finmarchicus*, fr.; *Sagitta*, f.	Grey skates,	1	12	1	16	...	...	*Doris*, sp. r.; *Hyas araneus*, fr.; *Eupagurus bernhardus*, f.; *Pandalus annulicornis*, fr.; *Carcinus mænas*, f.; *Asterias*, f.; *Solaster endeca*, r.; *Echinus miliaris*, f.; *Alcyonidium*, *Flustra*, *Chalina*, &c., f.	At beginning — Wind N.E., force 1; weather, hazy; sea, smooth; tide, 5½ hours ebb; barometer, 29·98; transparency, ⅔ fathom. At finish — Wind E., force 1; weather and sea as before; tide, ¼ hour flood; barometer, 29·96; transparency, ⅔ fathom.
					Thornback rays,	1	12	1	11	6	9		
					,, ,, .	8	5–7½	...	...	...	...		
					Plaice, . .	1	11	...	...	...	...		
					Long rough dabs,	3	9	2	6	...	...		
					Cod, . . .	3	20–22	1	15	3	7–9		
					,, . . .	7	4–6	...	...	...	...		
					Whitings, . .	1	9	3	8	5	7		
					,, . .	9	5½	...	...	...	...		
					Brassie, . .	1	7½	...	...	...	...		
					Pogge, . .	1	5	...	...	...	...		
					Liparis Montagui,	10	5	4	4	...	...		

* This Station was trawled on the 20th inst. but no fish were captured, it was therefore considered advisable to trawl it over again, which was done to-day.

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY.

Station, Date, and Time Trawl down.	Temperature			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 9th Feb. 1892. 12.25 p.m. to 2.45 p.m.	E. 49·0	4·8c	5·2c 15½ fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Tauria medusarum*, r.; *Calanus finmarchicus*, r.; *Sagitta*, r. Bottom Tow-net.—*Boreophausia*, sp. r.; *Parathemisto oblivia*, fr.; *Calanus finmarchicus*, c.; *Caligus rapax*, r.; *Sagitta*, fr.; small Ctenophora, f.; larval fish, 1.	Starry ray, . .	1	11	...	...	...	...	A small quantity of Zoophytes and weed.	At beginning—Wind W.N.W., force 2; weather, hazy; sea, slight; tide, ½ hour ebb; barometer, 30·08; transparency, 3 fathoms. At finish — Wind W., force 3; weather, sea, as before; tide, 2¾ hours ebb; barometer, 30·08; transparency, 3¼ fathoms.
					Plaice, . .	1	17	2	16	2	13		
					,, . .	1	12	...	...	...	...		
	W. 50·0	5·1c	5·0c 7½ fath.		Lemon sole, .	1	14½	...	...	...	...		
					Common dabs, .	1	12	7	9–10	3	7–8		
					,, ,, .	12	4–5	...	...	...	...		
					Long rough dabs,	1	9	1	8	...	...		
					Brill, . . .	2	12½	1	15	...	...		
					Sprat, . .	1	3½	...	...	...	...		
					Herrings, . .	27	3¼–1½	...	...	...	...		
STATION II. 9th Feb. 1892. 10.15 a.m. to 12.0 noon.	W. 43·8	4·5c	5·0c 8 fath.	Surface Tow-net.—*Boreophausia*, sp. r.; *Parathemisto. oblivia*, fr.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; *Sagitta*, r.; small Ctenophora, r. Bottom Tow-net.—*Boreophausia*, sp. r.; *Parathemisto oblivia*, f.; *Tauria medusarum*, r.; *Calanus finmarchicus*, fr.; *Caligus rapax*, r.; *Sagitta*, fr.; *Nerine*, r.	Thornback ray, .	1	12	...	...	...	...	One *Buccinum undatum*, one or two *Asterias*, and a little weed in trawl-net.	At beginning—Wind W., force 4; weather, hazy; sea, slight; tide, 4¼ hours flood; barometer, 30·07; transparency, 3 fathoms. At finish — Wind, weather, sea, as before; tide, high water; barometer, 30·08; transparency, 3 fathoms.
					Plaice, . .	2	14	4	13	1	12		
					Common dabs, .	1	6	8	5	...	...		
					Long rough dab, .	1	9½	...	...	...	...		
					Brill, . . .	1	12	...	...	...	...		
	E. 48·0	4·6	5·1 13 fath.		Cod, . . .	1	19½	...	...	...	...		
					Sprat, . .	1	4½	...	...	...	...		
					Herrings, . .	10	2½	...	...	...	...		
STATION III. 8th Feb. 1892. 4.5 p.m. to 5.30 p.m.	W. 45·0	4·8c	5·0c 9 fath.	Surface Tow-net.—*Parathemisto oblivia*, fr. Bottom Tow-net.—*Parathemisto oblivia*, f.; *Calanus finmarchicus*, f.; *Sagitta*, fr.	Starry ray, . .	1	11	...	...	...	...	A few *Asterias*, one or two *Ophioglypha albida*; and fragments of *Chalina* were the	At beginning—Wind N.W., force 3; weather, cloudy, fine; sea, slight; tide, 5½ hours ebb; barometer, 29·87; transparency, 3 fathoms.
					Common dabs, .	1	10	1	6	5	5		
					Long rough dab,	1	11	...	...	...	...		
	E. 43·5	4·7c	5·0c 13 fath.		Whitings, . .	1	5½	1	3½	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 8th Feb. 1892. 4.5 p.m. to 5.30 p.m. —*continued.*												only Invertebrates in the trawl-net.	At finish — Wind N.N.W., force 2; weather, sea, as before; tide, 1 hour flood; barometer, 29·91; transparency, 2½ fathoms.
STATION IV. 9th Feb. 1892. 7.45 a.m. to 10.0 a.m.	E. 40·7	4·3c	5·0c 10 fath.	Surface Tow-net.—*Boreophausia*, sp. r.; *Parathemisto oblivia*, fr.; *Calanus finmarchicus*, f.; *Sagitta*, f.; small Ctenophora, f.	Starry ray,	1	12	...	...	...	...		At beginning—Wind W., force 3; weather, overcast; sea, slight; tide, 1¾ hour flood; barometer, 30·05; transparency, 2 fathoms.
					Plaice,	4	15	5	14	15	13		
					,,	6	11	...	...	...	...		
					Common dabs,	1	13	3	7	6	5		
					,, ,,	6	4	...	...	...	...		
					Flounder,	1	15	...	...	...	...		
	S.W. 43·8	4·4	4·8 8 fath.	Bottom Tow-net. — *Atylus swammerdami*, r.; *Parathemisto oblivia*, fr.; *Calanus finmarchicus*, fr.; *Caligus rapax*, f.; *Sagitta*, fr.; *Tomopteris*, r.	Haddocks,	1	21	1	18	1	13		At finish — Wind W., force 4; weather, hazy; sea, slight; tide, 4 hours flood; barometer, 30·07; transparency, 3 fathoms.
					Cod,	1	30	1	28	1	23		
					Whitings,	2	4	...	...	...	...		
					Herrings,	38	1½–3	...	...	...	...		
					Pogge,	1	4½	...	...	...	...		
STATION V. 8th Feb. 1892. 1.20 p.m. to	S. 45·0	4·9c	5·2c 17 fath.	Surface Tow-net.—*Parathemisto oblivia*, r.; *Sagitta*, r.; small Ctenophora, r.; scarcely anything in the surface tow-net.	Plaice,	1	13	...	...	...	...	*Asterias*, sp. fr.; *Flustra* and other Zoophytes, f.; 1 *Buccinum undatum.*	At beginning—Wind N., force 3; weather, cloudy, fine; sea, slight; tide, 2¾ hours ebb; barometer, 29·79; transparency, 3 fathoms.
					Common dabs,	2	8	4	7	4	5		
					,, ,,	1	4	...	...	...	...		
					Long rough dab,	1	6	...	...	...	...		
					Turbot,	1	23	...	...	...	...		
	N. 45·0	4·8c	5·1 14 fath.	Bottom Tow-net.—*Parathemisto oblivia*, f.;	Whitings,	2	5	1	4	...	...		At finish — Wind N.W., force 2;

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION V. 8th Feb. 1892. 1.20 p.m. to —*continued.*				*Tauria medusarum*, r.; *Calanus finmarchicus*, r.; *Caligus rapax*, r.; *Sagitta*, f.; small Ctenophora, fr.									weather, sea, as before; tide, 4¾ hours ebb; barometer, 29·84; transparency, 3 fathoms.
STATION I. 8th March 1892. 11.0 a.m. to 1.0 p.m.	W. 38·0	38·5	39·0 7 fath.	Surface Tow-net. — *Parathemisto oblivia*, r.; *Calanus finmarchicus*, r.; *Temora longicornis*, r.; *Sagitta*, f.; fish ova, several.	Plaice, . .	1	15	2	14	1	12	*Asterias*, f.; *Aphrodite*, r.; some weed.	At beginning—Wind W., force 5; weather, clear; sea, slight; tide, ¾ hour ebb; barometer, 29·79 transparency, 3 fathoms.
					,, . .	1	11	...	...	...	...		
					Common dabs ,,	1	13	2	11	2	8–9		
					,, ,, .	3	5	...	...	...	...		
					Flounders, . .	1	17	1	11	1	10		
	E. 42·0	38·8	39·0 12 fath.	Bottom Tow-net. — *Parathemisto oblivia*, f.; *Tauria medusarum*, r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Sagitta*, f.; *Nerine*, sp. several; small Ctenophora, fr.; larval Crustacea, fr.; larval and post-larval fish, f.	,, . .	2	8	...	...	...	...		At finish — Wind W.N.W.; force 5; weather, clear; sea, slight; tide, 2¾ hours ebb; barometer, 29·77; transparency, 3 fathoms.
					Long rough dab,	1	8	...	...	...	...		
					Cod, . .	1	29	1	25	1	6		
					Father-lasher, .	1	6	...	...	...	...		
					Young herrings or sprats,	37	2–2½	...	...	...	...		
STATION II. 8th March 1892. 9.5 a.m. to 10.40 a.m.	E. 37·5	39·8	39·5 13 fath.	Surface Tow-net.—*Boreophausia*, sp. r.; *Parathemisto oblivia*, r.; *Calanus finmarchicus*, f.; *Sagitta*, f.; several fish ova.	Plaice, . .	2	17	2	12½	1	10	The only Invertebrates in trawl-net were one or two *Asterias.*	At beginning—Wind W., force 5; weather, clear; sea, slignt; tide, 4¾ hours flood; barometer, 29·81; transparency, 3½ fathoms.
					,, ,,	1	9	...	...	...	...		
					Common dabs, .	1	11	1	9½	1	8		
					,, ,, .	4	4–6	...	...	...	...		
					Flounders, . .	1	12	1	11	1	8		
	W. 38·0	38·4	39·0 9½ fath.	Bottom Tow-net. — *Boreopthausia*, sp. r.; *Parathemisto oblivia*, f.; *Tauria medusarum*, r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Sagitta*, f.; *Nerine*, sp. f.; small Ctenophora, fr.; larval Crustacea, fr.	Cod, . . .	1	23	...	...	...	...		At finish — Wind weather, sea, as before; tide, about high water; barometer, 29·79; transparency, 3 fathoms.
					Herrings or sprats,	7	2–2½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 8th March 1892. 7.5 a.m. to 8.40 a.m.	W. 33·5 E. 34·5	38·1 38·0	39·0 8 fath. 39·0 11½ fath.	Surface Tow-net. – *Boreophausia*, sp. r.; *Parathemisto oblivia*, r.; *Calanus finmarchicus*, r.; *Sagitta*, r.; two fish ova. Bottom Tow-net.—*Parathemisto oblivia*, f.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Caligus rapax*, fr.; *Sagitta*, f.; small Ctenophora, fr.	Plaice,	1	15½	5	12½	1	10	*Hyas araneus*; one or two *Asterias*, and a small quantity of weed were the only Invertebrates, &c., brought up in the trawl-net.	At beginning—Wind W., force 4; weather, dull, showers of sleet; sea, slight; tide, 2½ hours flood; barometer, 29·83; transparency, 2½ fathoms. At finish — Wind W., force 4; weather, cloudy; sea, slight; tide, 4 hours flood; barometer, 29·82; transparency, 3 fathoms.
					,,	2	7–8	...	...	...	...		
					Lemon sole,	1	7	...	...	...	...		
					Common dabs,	1	9	2	1	4	5		
					Flounder,	1	13	1	12	1	10		
					,,	1	9	...	...	...	...		
					Cod,	1	25	...	...	...	...		
					Whitings,	1	4	...	...	...	...		
					Young herrings or sprats,	29	2–2½	...	...	...	...		
STATION IV. 7th March 1892. 3.55 p.m. to 6.0 p.m.	N.E. 37·0 S.W. 36·5	38·4 38·1	38·7 5 fath. 39·0 7 fath.	Surface Tow-net. — *Parathemisto oblivia*, f.; small Ctenophora, f.; very little in the surface-net. Bottom Tow-net. — *Boreophausia*, sp. r.; *Mysis flexuosus*, r.; *Pseudocuma cercaria*, r.; *Calanus finmarchicus*, fr.; *Parathemisto oblivia*, f.; *Temora longicornis*. f.; *Dias longiremis*, f.; *Caligus rapax*, r.; *Sagitta*, fr.	Plaice,	3	14	6	13	2	11½	A small quantity of weed and Zoophytes only, in trawl-net.	At beginning—Wind variable, force, light; weather, dull; sea, easterly swell; tide, ¾ hour ebb; barometer, 29·93; transparency, 2 fathoms. At finish — Wind S.W., force 3; weather, sea, as before; tide, 3 hours ebb; barometer, 29·92; transparency, 1½ fathom.
					,,	3	10	...	...	...	...		
					Flounders,	1	15	1	7	...	...		
					Long rough dab,	1	8	...	...	...	...		
					Brill,	1	12	...	...	...	...		
					Cod,	1	27	...	...	...	...		
					Herrings or sprats,	14	2	...	...	...	...		
					Pogge,	1	4½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION V. 7th March 1892. 1.20 p.m. to 3.5 p.m.	S. 37·5 N. 37·0	38·8 40·1	39·5 16 fath. 38·4 13½ fath.	Surface Tow-net.—*Parathemisto oblivia*, f.; four fish ova. Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, r.; *Nerine*, sp. r.; some mud.	Plaice,	1	25	1	16½	2	12	Only a few *Asterias* and a small quantity of weed and Zoophytes in trawl-net.	At beginning.—Wind N.W., force 1; weather, dull; sea, easterly swell; tide, 4½ hours ebb; barometer, 29·98; transparency, 3 fathoms. At finish.—Wind S., force 2; weather, sea, as before; tide, low water; barometer, 29·97; transparency, 3 fathoms.
					"	2	6–8½	...	...	...	...		
					Common dabs,	2	10	2	9	6	7–8		
					" "	1	4½	...	...	...	...		
					Flounders,	1	14	1	10	1	9		
					Long rough dabs,	1	8	2	5	...	...		
					Whitings,	2	5	1	3½	...	...		
STATION I. 15th April 1892. 12.45 p.m. to 2.35 p.m.	E. 45·0 W. 43·0	41·6 42·9	41·3 12½ fath. 41.9 8 fath.	Surface Tow-net.—*Parathemisto*, r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; larval Crustacea (*Balani*, &c.), fr.; fish ova, fr. Bottom Tow-net.—*Boreophausia*, sp. f.; *Dulichia*, sp. r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Caligus rapax*, r.; *Sagitta*, f.; larval Crustacea (*Balani*, &c.), c.; young fish, f.	Thornback ray,	1	9½	...	...	...	...	*Hyas araneus*, r.; *Asterias*, f.; a small quantity of weed.	At beginning.—Wind S., force 3; weather, cloudy; sea, slight; tide, 2¾ hours flood; barometer, 29·72; transparency, 4 fathoms. At finish — Wind S.E., force 4; weather, dull; sea, moderate; tide, 4½ hours flood, barometer, 29·71; transparency, 4 fathoms.
					Plaice,	1	17	5	13–5	7	12		
					"	4	7–9	...	...	...	...		
					Common dabs,	10	9	9	8	10	6–7		
					" "	18	4–5	...	...	...	...		
					Flounders,	4	12–13	3	10–11	9	8		
					"	6	6–7½	...	...	...	...		
					Turbot,	1	27	...	...	...	...		
					Gurnards,	1	15	1	14	5	13		
					"	3	11–12	...	...	...	...		
					Whiting,	1	4½	...	...	...	...		
STATION II. 15th April 1892. 10.50 a.m. to 12.30 p.m.	W. 44·5 E. 43·5	42·5 42·3	42·0 8½ fath. 41·7 12 fath.	Surface Tow-net.—*Idotea marina*, r.; *Boreophausia*, sp. r.; fish ova, f. Bottom-net.—*Boreophausia*, sp. r.; *Bathyporeia*, sp. r.; *Dulichia*, sp. r.; *Calanus finmarchicus*, f.; *Temora*	Starry ray,	1	8½	...	...	...	...	*Corystes cassivelaunus*, r.; *Asterias*, r.; *Aphrodite aculeata*, r.	At beginning.—Wind variable, force, light; weather, clear; sea, smooth; tide, 1 hour flood; barometer, 29·74; transparency, 4½ fathoms.
					Thornback rays,	1	16	1	11	...	...		
					Plaice,	1	15	3	13–14	3	10–11		
					"	1	9	...	...	...	...		
					Common dabs,	1	12	2	7½	3	6		
					" "	3	4–5	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station II. 15th April 1892. 10.50 a.m. to 12.30 p.m. —*continued.*				*longicornis*, f.: *Nerine*, sp. f.; Crustacea (*Balani*, &c.), fr.; young fish, f.	Flounders,	1	17½	1	12	2	9		At finish. — Wind S.E., force 2; weather, cloudy; sea, slight; tide, 2½ hours high flood; barometer, 29·73; transparency, 3½ fathoms.
					,,	9	7–8	...	...	...	...		
					Gurnards,	1	16	2	13	4	12		
					Catfish,	1	37	...	...	...	...		
STATION III. 15th April 1892. 9 a.m. to 10.40 a.m.	E. 37·5 W. 45·0	41·6 42·9	41·1 12 fath. 41·9 8 fath.	Surface Tow-net.—*Atylus*, sp. r.; *Pseudocuma*, sp. r.; *Acartia longiremis*, f.; *Pseudocalanus elongatus*, f.; fish ova, f. Bottom Tow-net. — *Calanus finmarchicus*, f.; *Sagitta*, f.; larval Crustacea (*Balani*, &c.), c.; larval and post-larval fish, f.	Plaice,	2	15½	2	14	7	10–12	Nothing except fish in trawl net.	At beginning—Wind N. N. W., force 2; weather, clear; sea, slight; tide, 5 hours high ebb; barometer, 29·74; transparency, 4½ fathoms. At finish — Wind variable, force light; weather, clear; sea, smooth; tide, ¾ hour high flood; barometer, 29·74; transparency, 4½ fathoms.
					,,	9	7–9	...	...	...	...		
					Common dabs,	3	10–11	12	8–9	7	6–7		
					,, ,,	5	5	...	...	...	...		
					Flounders,	4	11–12	5	9–10	15	8		
					,,	5	7	...	...	...	...		
					Long rough dab,	1	9	...	...	...	...		
					Whitings,	3	5	10	4	5	3		
					Sprats,	6	4–5	...	...	...	...		
					Herrings,	3	3½	...	...	...	...		
STATION IV. 15th April 1892. 2.50 p.m. to 4.55 p.m.	S.W. 39·0 N.E. 34·0	42·9 41·7	42·0 8 fath. 41·4 8 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; larval Crustacea (*Balani*, &c.), c.; fish ova, f. Bottom Tow-net.—*Mysis*, sp. r.; *Pseudocuma*,	Thornback rays,	2	10	...	...	...	...	Several *Asterias*, some *Flustra* and a quantity of weed.	At beginning—Wind S. E., force 5; weather, dull; sea, moderate; tide, 4¾ hours flood; barometer, 29·70; transparency, 4 fathoms.
					Plaice,	2	10	1	12	1	8		
					,,	6	7	6	15	14	14		
					,,	24	12	38	9–10	...	...		
					Lemon soles,	1	7	...	...	...	...		
					Common dabs,	2	11	1	7	1	6		
					,, ,,	1	5	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 15th April 1892. 2.50 p.m. to 4.55 p.m. —*continued.*				sp. r.; *Eurydice pulchra*, r.; *Calanus finmarchicus*, f.; *Sagitta*, f.; larval Crustacea (*Balani*, &c.), fr.; young fish, f.	Flounders,	2	12	1	10	2	8–9		At finish — Wind N.N.W., force 3; weather, snow shower; sea, slight; tide, 1 hour ebb; barometer, 29·73; transparency, 3 fathoms.
					,,	9	6–7	...	...	...	...		
					Brill,	1	13	...	...	...	...		
					Whiting,	1	6	...	...	...	...		
					Gurnard,	1	15½	...	...	...	...		
					Herrings,	2	6	4	3	1	2		
STATION V. 15th April 1892. 7.5 a.m. to 8.45 a.m.	S. 35·0	41·2	41·3 16 fath.	Surface Tow-net. — *Acartia longiremis*, f.; larval *Balani*, f.; fish ova, fr.	Plaice,	1	21	1	14	3	13	A few *Asterias* were the only invertebrates in trawl net.	At beginning — Wind N.N.W., force 3; weather, clear sea, moderate; tide, 3 hours ebb; barometer, 29·70; transparency, 3 fathoms. At finish—Wind N.N.W., force 2; weather, clear; sea; slight; tide, 4¾ hours ebb; barometer, 29·74; transparency, 5 fathoms.
					,,	7	11–12	...	...	...	...		
					Common dabs,	1	11	2	9	7	6–7		
					,, ,,	10	4–5	...	...	...	...		
	N. 38·0	41·3	41·0 13 fath.	Bottom Tow-net.—*Boreophausia*, sp. f.; *Pseudocuma*, sp. r.; *Bathyporeia*, sp. r.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; larval Crustacea (*Balani*, &c.), c.; young Ophiuridæ, f.; *Sagitta*, f.; young fish, fr.	Flounders,	1	12	2	10½	1	9		
					,,	5	7–8	...	...	...	...		
					Long rough dabs,	2	7	1	5	...	...		
					Haddocks,	1	17	2	12	2	11		
					Whitings,	4	5½	4	5½	...	...		
					Bib,	1	7	...	...	...	...		
					Gurnards,	2	12	6	9–11	1	7		
					,,	1	6	...	...	...	...		
					Herrings,	1	5½	1		...	...		
STATION VI. 14th April 1892. 2.30 p.m. to 4.20 p.m.	N. 43·0	41·6	41·1 9 fath.	Surface Tow-net. — *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Acartia longiremis*, f.; larval and young Crustacea, fr.; fish ova, fr.	Plaice,	1	11	...	...	...	...	*Fusus antiquus*, several; *Asterias*, r.; *Echinus esculentus*, f.; some weed; net damaged	At beginning—Wind N.N.W., force light; weather, cloudy; sea, strong easterly swell; tide, 5¼ hours flood; barometer, 29·70; transparency, 6 fathoms.
					Lemon sole,	1	14	...	...	...	...		
					Common dabs,	1	8½	4	5½	2	4		
					Haddocks,	2	12	1	10	...	...		
					Whitings,	2	4½	1	3½	...	...		
					Bib,	2	7	...	...	...	...		
	S. 36·0	41·9	41·0 17 fath.	Bottom Tow-net.—*Te-*	Gurnards,	1	13	1	12	2	11		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 14th April 1892. 2.30 p.m. to 4.20 p.m.—*continued.*			41·0 19 fath.	*mora longicornis*, fr.; larval Crustacea, fr.; small *Sagitta*, c.; larval and post-larval fish, fr.	Gurnards,	2	9	...	...	...	...		At finish — Wind E.N.E., force 4; weather, snow shower; sea, strong easterly swell; tide, 1 hour ebb; barometer, 29·70; transparency, 5 fathoms.
					Catfish,	1	6	...	...	...	...		
STATION I. 13th May 1892. 1.15 p.m. to 3.25 p.m.	E. 49·0	46·1	43·6 14 fath.	Surface Tow-net.—*Dulichia*, r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Acartia longiremis*, f.; *Anomalocera patersonni*, f.; larval Crustacea (*Balani*, &c.), fr.; fish ova, f. Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Sagitta*, fr.; small Medusidæ, f.; larval and young Crustacea, f.; young fish, r.	Thornback rays,	1	23	1	18	...	...	*Octopus*, 1; *Asterias*, sp. f.; *Amphidotus*, f.; *Alcyonium*, f.; a quantity of weed and zoophyte.	At beginning—Wind W., force 2; weather, hazy, showery; sea, southerly sea; tide, 4¼ hours flood; barometer, 30·02; transparency, 4 fathoms. At finish — Wind S.W., force 2; weather, sea, as before; tide, ¼ hour ebb; barometer, 29·99; transparency, 3½ fathoms.
					Starry rays,	1	10	1	6½	...	...		
					Plaice,	2	16	7	13–14	8	10–12		
					,,	3	8	...	...	...	...		
	W. 54·0	47·5	44·1 10 fath.		Common dabs,	1	11	16	8–9	19	6–7		
					,, ,,	49	4–5	...	...	...	...		
					Long rough dab,	1	10	...	...	...	...		
					Gurnards,	3	13–14	15	10–11	44	7–8		
					,,	11	4–5	...	...	...	...		
					Sprat,	1	5	...	...	...	...		
STATION II. 13th May 1892. 3.40 p.m. to 5.15 p.m.	W. 53·0	47·1	44·4 10 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Acartia longiremis*, f.; larval Crustacea, f.; fish ova, very few. Bottom Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Cali-*	Thornback ray,	1	17	...	...	...	...	*Corystes cassivelaunus*, f.; *Asterias*, f.; *Astropecten irregularis*, r.; *Amphidotus cordatus*, f.; *Aphrodite aculeata*, r.; weed	At beginning.—Wind S.W., force 2; weather, hazy; sea, strong southerly swell; tide, ¾ hour ebb; barometer, 29·98; transparency, 3½ fathoms. At finish—Wind,
					Starry rays,	1	11	1	8	...	...		
					Plaice,	2	15–16	5	14	3	10–12		
					,,	12	7–8	...	...	...	...		
					Lemon soles,	1	6	...	...	...	...		
					Common dabs,	18	8–9	15	7	19	6		
	E. 52·0	46·0	44·0 13 fath.		,, ,,	23	5	...	...	...	...		
					Flounders,	1	8	1	7	...	...		
					Haddock,	1	11	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl Down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 13th May 1892. 3.40 p.m. to 5.15 p.m. —*continued.*				*gus rapax*, fr.; *Sagitta*, fr.; small Medusidæ, f.; larval and young Crustacea, f.; young fish, r.	Whitings, . .	1	10	1	6	1	5	and zoophytes, f.	variable, light; weather, sea, as before; tide, 2¼ hours ebb; barometer, 29·97; transparency, 3¼ fathoms.
					Gurnards, . .	29	12–13	51	9–10	42	6–7		
					,, . .	4	4–5	...	...	...	...		
					Dragonet, . .	1	7	...	...	...	...		
STATION III. 13th May 1892. 5.45 p.m. to 7.45 p.m.	E. 51·0 W. 52·0	46·0 46·6	44·0 13 fath. 45·0 9 fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; *Temora longicornis*, f.; *Acartia longiremis*, r.; larval Crustacea (*Balani*, &c.), f.; fish ova, r. Bottom Tow-net.—*Pseudocuma cercaria*, r.; *Calanus finmarchicus*, r.; *Pseudocalanus elongatus*, f.; *Sagitta*, r.; *Nerine*, r.; larval Crustacea (*Balani*, &c.), f.; young fish, r.	Plaice, . .	1	15	7	12–13	84	9–10	*Cancer pagurus*, r.; *Corystes cassivelaunus*, r.; *Portunus*, sp. r.; *Asterias*, c.; *Aphrodite aculeata*, f. *Alcyonium*, f.; weed and zoophytes common.	At beginning—Wind W.S.W., force 2; weather, hazy, showery; sea, strong southerly swell; tide, 2¾ hours ebb; barometer, 29·95; transparency, 3½ fathoms. At finish — Wind W.S.W., force 2; weather and sea as before; tide, 4¾ hours ebb; barometer, 29·93 transparency, 3 fathoms.
					,, . .	72	7½	...	...	...	...		
					Common dabs, .	10	10	17	8	18	6		
					,, ,,	7	4½	...	...	...	..		
					Flounder, . .	1	7	..	...	...	...		
					Long rough dabs,	2	8	...	...	...	...		
					Haddocks, . .	1	14	1	13	...	...		
					Whitings, . .	1	6	1	7	...	...		
					Gurnards, . .	7	12–13	14	9	32	6–7		
					,, . .	1	4	...	...	...	...		
					Pogge, . .	1	4½	...	...	...	...		
STATION IV. 12th May 1892. 3.5 p.m. to 5.30 p.m.	N.E. 47·0 S.E. 49·0	45·2 46·2	45·1 10 fath. 45·9 7 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Acartia longiremis*, r.; *Anomalocera patersoni*, r.; small Ctenophora, f.; fish ova, f. Bottom Tow-net.—*Calanus finmarchicus*, f.;	Thornback rays, .	1	18	1	11	...	...	*Buccinum undatum*, r.; *Hyas araneus*, f.; *Eupagurus bernhardus*, f.; *Asterias*, f.; *Solaster papposa* and	At beginning — Wind E.S.E., force 4; weather, hazy; sea, easterly swell; tide, ½ hour ebb; barometer, 30·33; transparency, 3 fathoms.
					Plaice, .	3	14	9	13	15	12		
					,, . .	25	6–9	...	...	...	...		
					Common dabs, .	4	8½	12	6½	30	4–5		
					,, ,, .	2	3	...	...	...	...		
					Cod, . . .	1	32	...	...	...	...		
					Gurnards, . .	1	15	2	11	9	8½		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 12th May 1892. 3.5 p.m. to 5.30 p.m. —*continued.*				*Temora longicornis*, f.; *Caligus rapax*, r.; *Sagitta*, fr.; *Nerine*, r.; larval and young Crustacea, fr.; young fish, f.	Gurnards,	6	6	...	...	...	...	*endeca*, f.; *Amphidotus cordatus*, f,; weed and Zoophytes, ab.	At finish—Wind, weather, as before; sea, strong easterly swell; tide, 3 hours ebb; barometer, 30·26; transparency, 3 fathoms.
					Butter-fish,	1	7	2	4	...	...		
STATION V. 12th May 1892. 12.23 p.m. to 2.20 p.m.	S. 44·0	44·0	43·2 17 fath.	Surface Tow-net.—Euphausidæ, r.; *Anomalocera patersoni*, f.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Acartia longiremis*, f.; larval Crustacea, f.; fish ova, f.	Grey skate,	1	19	...	...	...	...	Ascidians, f.; *Corystes cassivelaunus*, r.; *Asterias*, fr.; *Amphidotus cordatus*, f.; *Flustra*, r.	At beginning—Wind E., force 3; weather, a little hazy; sea, easterly swell; tide, 3½ hours flood; barometer, 30·38; transparency, 5½ fathoms. At finish—Wind E., force 4; weather, hazy; sea, as before; tide, 5½ hours flood; barometer, 30·35; transparency, 3½ fathoms.
					Thornback ray,	1	21	...	...	...	...		
					Starry Ray,	1	10	...	...	...	...		
					Plaice,	1	16	1	11	...	...		
					Lemon soles,	1	12	1	10	...	...		
					Common dabs,	2	8	3	7	7	6		
					,, ,,	48	4–5	...	...	...	...		
	N. 46·0	45·9	43·8 15 fath.	Bottom Tow-net.—*Dulichia*, sp. v. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Sagitta*, fr.; larval and young Crustacea, f.; young fish, r.	Brill,	1	14	...	...	...	...		
					Haddock,	1	14	...	...	...	...		
					Whitings,	1	9	1	8	...	...		
					Gadus minutus,	1	3½	...	...	...	...		
					Gurnards,	2	12-13	3	10-11	125	6-8		
					,,	46	4–5	...	...	...	...		
					Dragonet,	1	7	...	...	...	...		
					Pogge,	1	4	...	...	...	...		
					Lumpsucker,	1	11	...	...	...	...		
STATION I. 8th June 1892. 4.35 p.m. to 6.50 p.m.	E. 55·4	50·2	45·8 13 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, c.; *Evadne*, f.; Small Medusidæ, f.; young Crustacea, fr.; post-larval fish, 3. Bottom Tow-net.—*Temora*	Thornback ray,	1	21	...	...	...	...	*Corystes cassivelaunus*, r.; *Mactra stultorum*, r.; *Asterias*, c.; *Solaster endeca*, r.; *Astropecten irregularis*, r.; *Al-*	At beginning—Wind S.S.E., force 4; weather, hazy; sea, slight; tide, 3½ hours ebb; barometer, 30·25; transparency, 6 fathoms.
					Plaice,	4	16–17	7	13–15	11	11–12		
					,,	101	6–9	8	9	32	7½		
					Common dab,	4	10–11	...	...	...	...		
					,, ,,	103	5–6	...	...	...	...		
					Black sole,	1	17	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 8th June 1892. 4.35 p.m. to 6.50 p.m. —*continued.*	W. 59·0	51·6	47·8 6½ fath.	*longicornis*, r.; *Acartia*, sp. r.; *Alteutha*, sp. r.; *Pseudocalanus*? (with ova), 1 small Medusidæ, f.; *Appendicularia*, f.; Gelatinous algæ, fr.	Whiting, . .	1	6½	...	...	. .	...	*cyonium* r.; a little weed and zoophytes.	At finish — Wind W.N.W., force 1; weather, hazy; sea, smooth; tide, 5¾ hours ebb; barometer, 30·26; transparency, 5 fathoms.
					Gurnards, . .	5	10-12	38	9	48	8		
					,, . .	58	6	...	...	...	...		
STATION II. 9th June 1892. 6.25 a.m. to 8.20 a.m.	W. 65·0	50·9	47·3 7½ fath.	Surface Tow-net.—*Temora longicornis*, fr.; young Crustacea (*Boreophausia*, Brachyura), fr.; small Medusidæ, f.	Plaice, . .	2	13–15	21	10–11	7	8	*Buccinum undatum*, r.; *Corystes cassivelaunus*, r.; *Asterias*, fr.; *Amphidotus cordatus*, f.	At beginning—Wind calm; weather, hazy; sea, smooth; tide, 5 hours ebb; barometer, 30·24; transparency, 5 fathoms. At finish — Wind, weather and sea as before; tide, 1 hour flood; barometer, 30·24; transparency, 4 fathoms.
					,, . .	5	5	...	...	...	...		
					Common dabs, .	2	10	15	9	1	8		
					,, ,, .	48	5-6½	...	...	...	...		
				Bottom Tow-net.—*Temora longicornis*, fr.; *Acartia*, sp. f.; *Podon*, f.; *Sagitta*, f.; *Appendicularia*, f; small Medusidæ, fr.; young Crustacea, f.; Gelatinous algæ, fr.	Flounders, . .	1	9	...	...	...	...		
	E. 66·8	51·4	45·8 13 fath.		Whiting, . .	1	5	...	...	...	...		
					Gurnards, . .	2	13	2	11	27	9		
					,, . .	55	6-7	...	...	...	...		
STATION III. 8th June 1892. 11.40 a.m. to 1.40 p.m.	W. 64·7	52·7	47·7 7½ fath.	Surface Tow-net.—*Temora longicornis*, f.; *Acartia*, sp. f.; post-larval fish, v.r.	Thornback rays, .	2	24	1	23	...	...	*Portunus holsatus*, r.; *Corystes*, sp. r.; *Asterias*, c.; large quantity of weed and some zoophytes.	At beginning—Wind S.E. by E.; force 3; weather, hazy; sea, slight; tide, 4¾ hours flood; barometer, 30·31; transparency, 5 fathoms. At finish—Wind S.S.E., force 2; weather, hazy; sea, slight; tide, ¾ hour ebb; barometer, 30·30; transparency, 5¼ fathoms.
					Plaice, . .	2	17	22	14–15½	110	9-12		
					,, . .	114	6-7	...	...	...	...		
					Common dabs, .	30	9-10	52	7	65	5½		
				Bottom Tow-net.—*Temora longicornis*, f.; small Medusidæ, f.; Amphipod f.; sp.; 1 young Crustacea, Gelatinous algæ, ab.	,, ,,	31	4½	...	...	...	...		
	E. 57·5	51·4	45·7 12 fath.		Long rough dabs,	3	9	5	8	1	7		
					Turbot, . .	1	15	..	...	...	...		
					Gurnards, . .	1	15	13	11–13	40	8–9		
					,, . .	53	5–6½	...	...	...	...		
					Angler, . .	1	11	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 8th June 1892. 8.10 a.m. to 10.30 a.m.	E. 56·5 W. 61·6	50·6 51·2	46·1 10 fath. 48·9 4 fath.	Surface Tow-net.—*Temora longicornis*, f.; larval Crustacea, fr.; Gelatinous algæ, fr.; ova, f. Bottom Tow-net.—*Temora longicornis*, f.; small Medusidæ, f.; young Crustacea, fr.; Gelatinous algæ, fr.: very little in tow-nets.	Thornback rays,	2	24	1	22	2	20	*Asterias*, fr.; *Aphrodite aculeata*, r.; a large quantity of weed.	At beginning—Wind calm; weather, hazy, sea, smooth; tide, 1¼ hour flood; barometer, 30·33; transparency, 5½ fathoms. At finish—Wind E., force 1; weather, hazy; sea, smooth; tide, 3½ hours flood; barometer 30·31; transparency, 4 fathoms.
					” ”	2	15	...	...	...	...		
					Plaice,	5	15–16	4	14	34	10–11		
					”	267	5½–8	...	...	...	...		
					Common dabs,	22	10–11	32	8	35	6		
					” ”	17	4	...	...	...	...		
					Flounders,	1	10	3	8	1	7		
					Long rough dab,	1	8	...	...	...	...		
					Brill,	1	15½	...	...	...	...		
					Gurnards,	3	14	16	11	44	9		
					”	29	6–7	...	...	...	...		
					Angler,	1	7	...	...	...	...		
STATION V. 8th June 1892. 2.10 p.m. to 4.15 p.m.	N. 58·0 S. 56·7	50·5 49·6	45·5 16 fath. 45·5 15 fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; *Temora longicornis*, f.; *Acartia*, sp. f.; *Sagitta*, r.; fish ova, r. Bottom Tow-net.—*Calanus finmarchicus*, r.; *Temora longicornis*, f.; *Appendicularia*, f.; *Sagitta*, r.; small Medusidæ, f.; Gelatinous algæ, fr.	Thornback ray,	1	15	...	...	...	...	*Corystes cassivelaunus*, r.; *Asterias*, c.; *Astrospecten irregularis*, r.; *Amphidotus cordatus*, fr.; small quantity of weed and zoophytes.	At beginning—Wind S.S.E., force 2; weather, hazy; sea, slight; tide, 1¼ hour ebb; barometer, 30·30; transparency, 6 fathoms. At finish — Wind S.S.E., force 4; weather and sea as before; tide, 3¼ hours ebb; barometer, 30·26; transparency, 6 fathoms.
					Plaice,	3	14–15	15	13	5	9		
					”	14	7–8	...	...	...	...		
					Common dabs,	3	7	20	6	37	5		
					Whitings,	1	11	1	10	1	5		
					Gurnards,	1	17	1	12	73	8–9		
					”	45	6–7	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl ❏ down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 7th October 1892. 2 p.m. to 4.10 p.m.	E. 48·0 W. 47·0	10·4 10·0	10·7 15 fath. 10·9 8 fath.	Surface Tow-net.—*Calanus finmarchicus*, r.; *Temora longicornis*, r.; young Crustacea, r. Bottom Tow-net.—*Siriella*, sp.(? *armata*) v.r.; *Hyperoche*, sp. f.; *Diastylis*, sp. f.; *Eudorella truncata*, r.; *Pseudocuma cercaria*, f.; *Bathyporeia*, sp. f.; *Eurydice pulchra*, v.r.; *Protella phasma*, r.; *Calanus finmarchicus*, fr.; *Temora longicornis*, fr.; *Caligas rapax*, f.; *Sagitta*, a.; young herring, f.; young Crustacea, fr.; Ctenophora, fr.	Plaice, . .	1	12	...	...	...	...	*Asterias*, f.; *Aurelia*, c.	At beginning — Wind N.W. by W., force 3; weather, dull, with rain; sea, moderate; tide, 5¼ hours flood; barometer, 29·20; transparency, 4 fathoms. At finish—Wind N.W. by N., force 4; weather, and sea, as before; tide, 1½ hour ebb; barometer, 29·20; transparency, 2 fathoms.
					Common dab, .	1	9	...	...	...	...		
					Haddock, . .	1	4	...	...	...	...		
					Whitings, . .	2	6	2	5	...	...		
					Gurnards, . .	2	13	1	12	...	...		
					Angler, . .	1	18	...	...	...	...		
STATION II. 8th October 1892. 6.40 a.m. to 8.10 a.m.	W. 45·5 E. 46·0	9·8 10·3	10·7 8 fath. 10·9 13 fath.	Surface Tow-net — *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Centropages*, sp. f.; *Acartia longiremis*, f.; young Crustacea, f.; *Appendicularia*, r. Bottom Tow-net — *Hyperia*, r.; *Hyperoche*, f.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Sagitta*, fr.; Ctenophora, c.	Plaice, . .	1	10½	2	9½	2	8½	*Eledon cirrhosa*, v.r.; *Asterias*, f.; *Aurelia*, fr.	At beginning—Wind W.N.W., force 6; weather, overcast; sea, moderate; tide, 3½ hours ebb; barometer, 29·32; transparency, 3 fathoms. At finish — Wind, W.N.W., force 7; weather, overcast; sea, rough; tide, 5 hours ebb; barometer, 29·36; transparency, 3 fathoms.
					Common dabs, .	1	8½	1	4	...	...		
					Whitings, . .	5	5	1	4	...	...		
					Gurnard, . .	1	12	...	...	...	...		
					Angler, . .	1	12	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 8th Oct. 1892. 10.53 a.m. to 12.30 p.m.	E. 47·5 W. 48·0	10·2 10·0	10·8 14 fath. 10·8 8 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Temora longicornis*, f.; young Crustacea, f. Bottom Tow-net—Contained a quantity of shell, sand, and many Ophiurids; it had touched the bottom.	Thornback ray,	1	12½	...	...	...	...	*Asterias*, f.; *Aurelia*, fr.	At beginning—Wind W.N.W., force 7; weather, overcast; sea, rough; tide, 1½ hour flood; barometer, 29·38; transparency, 2¾ fathoms. At finish—Wind, weather and sea as before; tide, 2 hours flood; barometer, 29·37; transparency, 3 fathoms.
					Plaice,	3	14–16	11	11–12	21	8–10		
					Common dabs,	2	11	4	9	5	7–8		
					,, ,,	1	4	...	...	...	...		
					Long rough dabs,	2	10–10½	...	...	...	...		
					Haddocks,	1	23	10	5	...	...		
					Cod,	8	4	...	...	...	...		
					Whitings,	11	6	37	4–5	...	...		
					Gurnards,	2	14	...	...	...	...		
					Angler,	1	16½	...	...	...	...		
STATION IV. 11th Oct. 1892. 7.20 a.m. to 9.25 a.m.	W. 44·0 E. 47·0	9·5 9·8	10·3 7 fath. 10·4 12 fath.	Surface Tow-net damaged. Bottom Tow-net.—*Crangon allmanni*, r.; *Mysis*, sp. r.; *Macropsis slabberi*, f.; *Atylus*, sp. c.; *Pseudocuma cercaria* and *diastylus*, f.; *Monoculodes longimanus*, f.; *Hyperoche*, f.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Sagitta*, fr.; Ctenophora, c.; young Schizopods, Decapods, Lamellebranchs, Gastropods, Ophiurids, Cumacea and Annelids more or less frequent; some weedy debris.	Thornback ray,	1	19	...	...	...	...	*Hyas coarctatus*, r.; *Portunus holsatus*, f.; large Medusids, f.; zoophytes, fr.; weed, ab.	At beginning—Wind N.N.W.; force 2; weather, dull, showery; sea, slight; tide, 1¾ hour ebb; barometer, 29·96; transparency, 3¼ fathoms. At finish—Wind N., force 4; weather, cloudy; sea, moderate; tide, 3¾ hours ebb; barometer, 30·00; transparency, 3 fathoms.
					Starry ray,	1	12	...	...	...	...		
					Plaice,	1	13	24	11–12	137	9–10		
					,,	40	7–8	...	...	...	...		
					Common dabs,	7	11–12	13	8-9	15	6–7½		
					,, ,,	8	5	...	...	...	...		
					Flounders,	1	10½	...	...	..	...		
					Haddocks,	1	23	2	18	1	13½		
					Cod,	1	36	2	31	1	29½		
					,,	2	25	...	...	...	...		
					Gurnards,	7	15	3	13	3	12		
					Dragonet,	1	8	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature. Air. Dry Bulb.	Temperature. Water. Surface.	Temperature. Water. Bottom.	Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish. No.	Inches	No.	Inches	No.	Inches	Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
STATION V. 11th Oct. 1892. 9.55 a.m. to 11.50 a.m.	N. 52·5 S. 52·0	9·8 10·1	10·5 14½ fath. 10·7 14½ fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Temora longicornis*, r.; *Caligus*, r.; *Sagitta*, f.; Ctenophora, f. Bottom Tow-net.—*Atylus bispinosus*, f.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Caligus*, f.; *Sagitta*, fr.; Ctenophora, c.; young Crustacea and Ophiurids, f.	Thornback ray,	1	14	...	...	...	...	*Portunus holsatus*, r.; *Corystes cassivelaunus*, r.; *Asterias*, f.; *Alcyonium*, r.; some weed.	At beginning—Wind N., force 5; weather, cloudy; sea, moderate; tide; 4¼ hours ebb; barometer, 30·00; transparency, 4 fathoms. At finish—Wind N., force 6; weather, cloudy; sea, rough; tide, low water; barometer, 30·05; transparency, 5 fathoms.
					Starry ray,	1	11	...	...	...	...		
					Plaice,	2	14–16	31	12–13	19	10–11		
					,,	8	9	...	...	...	...		
					Lemon sole,	1	12	...	..	...	...		
					Common dabs,	3	10–12	8	9	50	6–7		
					,, ,,	12	5	...	...	...	...		
					Turbot,	2	14	...	...	...	...		
					Haddocks,	10	6	...	...	...	...		
					Whitings,	8	5	1	3	...	...		
					Gurnards,	1	16	5	9–10	9	5–6		
					Dragonet,	1	6	...	...	...	...		
STATION VI. 11th Oct. 1892. 12.40 p.m. to 2.40 p.m.	N. 47·0 S. 53·0	10·0 10·0	10·5 15½ fath. 10·7 16 fath.	Surface Tow-net.—*Acartia longiremis*, f.; *Sagitta*, f.; Ctenophora, f.; young Crustacea, f. Bottom Tow-net.—*Hyperoche*, r.; *Calanus finmarchicus*, r.; *Temora longicornis*, fr.; *Caligus*, f.; *Sagitta*, fr.; Ctenophora, c.; young Crustacea, f.	Plaice,	3	12–14	37	11	64	8–9	*Cancer pagurus*, 1; *Portunus holsatus*, f.; *Corystes cassivelaunus*, r.; *Asterias*, fr.; *Alcyonium*, f.; some weed.	At beginning—Wind N.E. by N., force 6; weather, cloudy; sea, rough; tide, ¾ hour flood; barometer, 30·05; transparency, 4 fathoms. At finish — Wind N.N.E., force 5; weather and sea, as before; tide, 2¾ hours flood; barometer, 30·06; transparency, 5 fathoms.
					Common dabs,	2	10–12	33	8–9	75	7		
					,, ,,	9	4–6	...	...	...	...		
					Haddocks,	24	6	24	5	...	...		
					Whitings,	1	6	6	5	...	...		
					Gurnards,	2	14–15	6	12	5	7		
					,,	2	4	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—II. St Andrews Bay—*continued*.

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station I. 7th Nov. 1892. 2.0 p.m. to 4.20 p.m.	E. 47·0 W. 44·0	7·4 7·3	9·0 13 fath. 8·2 7 fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, f.; Ctenophora, f.; young Crustacea, c.; Infusoria, fr. Bottom Tow-net.—*Hyperoche*, sp. f.; *Calanus finmarchicus*, fr.; *Temora longicandata*, f.; *Caligus rapax*, r.; *Sagitta*, c.; Ctenophora, c.	Starry ray, . .	1	7½	...	...	...	...	*Portunus holsatus* and *depurator*, f.; *Asterias*, r.; a small quantity of weed.	At beginning—Wind W., force 1; weather, fog; sea, smooth; tide, 4¼ hours flood; barometer, ; transparency, . At finish—Wind S. S. W., force light; weather, fog; sea, smooth; tide, ½ hour ebb; barometer, 30·07; transparency, 3 fathoms.
					Plaice, . .	1	17	5	13–14	9	11–12		
					Lemon soles, .	1	6½	...	...	...	...		
					Common dabs, .	2	11½	...	...	...	...		
					Long rough dabs,	1	13	...	...	...	...		
					Turbot, . .	1	15	2	14	...	...		
					Whitings, . .	12	7	85	3½–5½	...	...		
					Gurnards, . .	2	16½	1	14	7	12–13		
					,, . .	5	11	...	...	...	...		
Station II. 8th Nov. 1892. 7.0 a.m. to 8.50 a.m.	W. 47·0 E. 47·0	7·5 7·7	8·5 8 fath. 9·0 12 fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, f.; Ctenophora, fr.; young Crustacea, c. Bottom Tow-net.—*Hyperoche*, f.; *Calanus finmarchicus*, fr.; *Temora longicornis*, f.; *Caligus rapax*, f.; *Sagitta*, c.; *Tomopteris*, fr.; Ctenophora, c.	Thornback ray, .	1	13	...	...	...	...	A few *Portunus holsatus* only.	At beginning—Wind S.W., force 1; weather, hazy; sea, smooth; tide, 2¾ hours ebb; barometer, 30·0; transparency, 3 fathoms. At finish — Wind S.W., force 3; weather, overcast with rain; sea, slight; tide, 4¾ hours ebb; barometer, 30·01; transparency, 3 fathoms.
					Plaice, . .	1	13	1	11	...	...		
					Common dabs, .	1	9¾	1	8½	1	8		
					Haddock, . .	1	6	...	...	...	...		
					Cod, . . .	2	4–4½	...	...	...	...		
					Whitings, . .	1	8	50	4–6½	...	...		
					Gurnards, . .	1	15	2	14	2	13		
					,, . .	3	11–12½	...	...	...	...		
Station III. 8th Nov. 1892. 12.10 p.m. to 2.0 p.m.	W. 50·0 E. 50·0	7·8 7·9	8·8 8 fath. 8·9 12 fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, f.; Ctenophora, f.; Brachyurous Crustacea (young), c.; Infusoria, fr. Bottom Tow-net.—Tow-	Thornback rays, .	1	10	1	8½	...	...	*Portunus holsatus*, f.; *Asterias*, sp. f.; *Aphrodite aculeata*, r.; very little in trawl net.	At beginning—Wind S.W., force 4; weather, overcast; sea, slight; tide, 1¾ hour flood; barometer, 29·93; transparency, 3½ fathoms. At finish—Wind, as
					Starry ray, . .	1	10¼	...	...	...	...		
					Plaice, . .	1	11¾	...	...	...	...		
					Common dabs, .	4	9–10	12	7–8½	2	5–6½		
					Long rough dab, .	1	10½	...	...	...	...		
					Haddocks, . .	1	12¾	5	6	...	...		
					Cod, . . .	1	4½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION III. 8th Nov. 1892. 12.10 p.m. to 2.0 p.m. —*continued.*				net touched the bottom, and was hauled up partly filled with sand.	Whitings, . .	55	3½–6½	...	...	...	...		before; weather, as before with rain; sea, moderate; tide, 3½ hours flood; barometer, 29·92; transparency, 2¾ fathoms.
					Gurnards, . .	1	12½	1	5	4	2¼–3		
STATION IV. 9th Nov. 1892. 7.50 a.m. to 10.40 a.m.	W. 51·0 E. 51·0	8·5 8·4	8·8 6 fath. 8·9 11 fath.	Surface Tow net.—*Parthemisto*, f.; *Hyperoche*, sp. fr.; Ctenophora, ab. Bottom Tow net. — *Hyperia*, sp. fr.; *Sagitta*, fr.; Ctenophora, ab.	Starry ray, .	1	9	...	...	...	...	*Asterias*, f.; a considerable quantity of weed.	At beginning—Wind S.W., force 4; weather, dull; sea, slight; tide, 2¾ hours ebb; barometer, 29·90; transparency, 2¾ fathoms. At finish — Wind S.S.W., force 5; weather, dull; sea, choppy; tide, 5½ hours ebb; barometer, 29·88; transparency, 3¼ fathoms.
					Plaice, . .	1	15	18	12–13	25	10–11		
					,, . .	2	9½	...	...	...	...		
					Common dabs, .	2	10	3	5	1	4		
					Haddocks, . .	1	23	1	22	1	21		
					,, . .	1	18	...	...	...	...		
					Cod, . . .	1	32	1	30	1	28		
					Whitings, . .	1	6	1	5	3	4		
					Gurnards, . .	3	13–13¾	...	...	...	...		
STATION V. 8th Nov. 1892. 2.25 p.m. to 4.5 p.m.	N. 49·0 S. 49·0	8·0 7·8	9·0 15 fath. 9·0 18 fath.	Surface Tow-net.—*Parathemisto*, sp. r.; *Hyperoche*, sp. f.; Ctenophora, c. Bottom Tow-net. — *Calisoma crenata*, r.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, c.; *Temora longicornis*, fr.; *Acartia longiremis*, f.; *Caligus*, sp. r.; *Sagitta*, c.; Ctenophora, fr.	Common dabs, .	1	8½	2	7	3	6	*Portunus holsalus*, fr.; *Asterias*, sp. f.; a small quantity of weed; very little in net.	At beginning—Wind S.W., force 6; weather, overcast; sea, choppy, tide, 3¾ hours flood; barometer, 29·91; transparency, 3½ fathoms. At finish — Wind, weather and sea, as before; tide, near high water; barometer, 29·88; transparency, 3 fathoms.
					Haddocks, . .	4	6	6	5	...	...		
					Cod, . . .	1	6	...	...	...	...		
					Whitings, . .	4	6	1	4	...	...		
					Gurnard, . .	1	2½	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. (New Station S.W. by S. of Bell Rock). 10th Nov. 1892. 10.25 a.m. to 12.15 p.m.	S. 47·0 N. 49·5	8·3 8·4	9·2 23 fath. 9·0 fath.	Surface Tow-net.—*Calanus finmarchicus*, f.; *Acartia longiremis*, f.; *Sagitta*, f.; Ctenophora, f. Bottom Tow-net.—*Calanus finmarchicus*, fr.; *Temora longicornis*, c.; *Centropages*, sp. f.; *Caligus rapax*, f.; *Sagitta*, f.; Ctenophora, f.	Starry ray,	1	$5\frac{1}{4}$	...	...	...	...	*Pecten opercularis*, r.; *Portunus holastus*, r.; *Stenorhyncus*, sp. r.; *Asterias*, f.; *Ophiothrix*, f.; *Echinus esculentus*, several; large *Atinoloba*, fr.; *Pycnogonum littorale*, 3.	At beginning—Wind W., force 1; weather, hazy; sea, slight; tide, $4\frac{1}{2}$ hours ebb; barometer, 30·0; transparency, 5 fathoms. At finish — Wind W.S.W., force 2; weather, a little hazy; sea, slight; tide, $\frac{1}{4}$ hour flood; barometer, 30·0; transparency, 5 fathoms.
					Sandy ray,	1	8	...	...	...	...		
					Plaice,	3	16	4	13–14	2	11		
					,, ,,	1	$9\frac{1}{2}$	...	...	...	...		
					Lemon soles,	3	$13\frac{1}{2}$	1	$11\frac{1}{2}$	2	$10\frac{1}{2}$		
					,, ,,	1	$8\frac{1}{2}$	...	...	...	...		
					Common dabs,	1	$10\frac{3}{4}$	1	$9\frac{1}{2}$	8	$7–8\frac{1}{2}$		
					,, ,,	6	$4\frac{1}{2}–6\frac{1}{2}$	...	...	...	...		
					Long rough dabs,	1	10	1	9	3	8		
					,, ,, ,,	11	$6–7\frac{1}{2}$	...	...	...	...		
					Turbot,	1	$15\frac{1}{4}$	...	...	...	...		
					Haddocks,	2	15	2	13	3	9–11		
					,,	31	$5–6\frac{1}{2}$	...	...	...	...		
					Cod,	1	$19\frac{1}{2}$	...	...	...	...		
					Whitings,	1	9	1	8	18	5–6		
					Brassie,	1	6	...	...	...	...		
					Gurnards,	3	$12\frac{1}{2}$	2	$10–11\frac{1}{2}$	1	9		
					,,	7	$4\frac{1}{2}–5$	...	...	...	...		
					Anglers,	1	14	1	13	1	12		
					Sand-eel,	1	6	...	...	...	...		
STATION I. 8th Dec. 1892. 11.25 a.m. to 1.30 p.m.	W. 35·5 E. 36·0	4·6 6·1	5·5 $6\frac{1}{2}$ fath. 6·4 $12\frac{1}{2}$ fath.	Surface Tow-net.—*Parathemisto*, sp. f.; *Calanus finmarchicus*, r.; *Sagitta*, r.; Ctenophora, r. Bottom Tow-net.—*Clione borealis*, one specimen; *Euphausidæ*, r.; *Mysis*, sp.; f.; *Macropsis slabberi*, r.;	Plaice,	1	16	2	$14\frac{1}{2}$	...	...	*Asterias*, f.; zoophytes and weed, very small quantity.	At beginning—Wind W.N.W., force 2; weather, becoming overcast; sea, slight; tide, about low water; barometer, 30·08; transparency, $2\frac{1}{2}$ fathoms.
					Lemon soles,	1	$6\frac{1}{2}$	...	...	...	...		
					Common dabs,	1	11	1	$8\frac{1}{2}$	2	6		
					Cod,	1	31	2	$27\frac{1}{2}$	...	...		
					Whitings,	1	8	4	7	8	6		
					Herring,	1	4	...	...	...	...		
					Sprats,	2	$3\frac{1}{2}$	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air. Dry Bulb.	Water. Sur-face.	Water. Bot-tom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 8th Dec. 1892. 11.25 a.m. to 1.30 p.m. —*continued.*				*Gastrosaccus spinifer*, r.; *Siriella armata*, r,; *Atylus*, sp. f.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, c.; *Caligus rapax*, fr.; *Sagitta*, fr.; Ctenophora, f.									At finish — Wind W.S.W., force 1; weather, overcast; sea, smooth, easterly swell; tide, 2 hours flood; barometer, 30·02; transparency, 3 fathoms.
STATION II. 8th Dec. 1892. 2.0 p.m. to 3.50 p.m.	E. 36·3 W. 33·5	5·8 4·8	6·6 13 fath. 5·8 8 fath.	Surface Tow net.—*Mysis*, sp. r.; *Parathemisto*, sp. f.; *Caligus rapax*, r.; Ctenophora, f. Bottom-Tow net.—Euphausidæ, f.; *Mysis*, sp. f.; *Hyperoche*, sp. r.; *Parathemisto*, sp. f.; *Cumacea*, r.; *Calanus finmarchicus*, c.; *Sagitta*, ab.; young fish (sand eels), r.	Starry rays, . Sandy ray, . . Plaice, . . Lemon sole, . Common dabs, . Turbot, . . Cod, . . . Whiting, . . Dragonet, . . Fatherlasher, .	2 1 1 1 1 1 1 1 2 1	12 9 13 13 6 14 31 5 8 6	... ... 1 ... 1 ... 3	... ... 11 ... 5 ... 26	... ... 1	... ... 4	*Asterias*, fr.; very little in net.	At beginning—Wind W.S.W., force 2; weather, overcast; sea, north easterly swell; tide, 2⅓ hours flood; barometer, 29·99; transparency, 3 fathoms. At finish.—Wind W.N.W., force 1; weather, snow; sea, easterly swell; tide, 4¼ hours flood; barometer, 29·89, transparency, 2 fathoms.
STATION III. 6th Dec. 1892. 1.50 p.m. to 3.35 p.m.	E. 39·8	6·3	6·8 14 fath.	Surface Tow-net.—*Hyperoche*, sp. f.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, f.; *Ctenophora*, fr. Bottom tow net.—*Thy-*	Plaice, . .	1	20	1	15	1	11	Nil.	At beginning—Wind N.E., force 5; weather, cloudy; sea, choppy; tide, 3¾ hours flood; barometer, 29·71; transparency, 3 fathoms.

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—II. St Andrews Bay—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c., brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station III. 6th Dec. 1892. 1.50 p.m. to 3.35 p.m. —*continued.*	W. 39·5	5·7	5·9 8 fath.	*sanoessa*, sp. f.; *Macropsis slabberi*, f.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, c.; *Caligus rapax*, f.; *Sagitta*, c.; Ctenophora, fr.				...	...	...	...		At finish.—Wind N.N.E., force 5; weather and sea, as before; tide, 5½ hours flood; barometer, 29·75; transparency, 3½ fathoms.
Station IV. 8th Dec. 1892. 8.20 a.m. to 10.55 a.m.	E. 35·7	5·6	6·1 7½ fath.	Surface Tow-net. *Thysanoessa*, sp. r.; *Hyperoche*, fr.; *Parathemisto*, f.; *Calanus finmarchicus*, f.; *Sagitta*, f.; Ctenophora, c.	Grey skate,	1	12	...	...	...	...	*Hyas coarctatus*, f.; *Portunus holsatus*, f.; *Asterias*, f.; some weed.	At beginning—Wind W.N.W., force 3; weather, slight haze; sea, slight; tide, 3 hours ebb; barometer, 30·13; transparency, 1 fathom.
					Starry ray,	1	11	...	...	...	...		
					Plaice,	1	17	4	12	2	10–11		
					,,	1	5	...	...	...	...		
					Common dabs,	3	10–11	9	8	1	7		
	W. 35·0	4·9	5·8	Bottom Tow-net.—*Mysis*, sp. f.; *Macropsis slabberi*, f.; *Atylus*, sp. f.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, fr.; *Caligus rapax*, f.; *Sagitta*, r.; Ctenophora, ab.	,, ,,	2	5	...	...	...	...		
					Flounders,	1	16	1	15	...	...		At finish—Wind W.N.W., force 2, weather, becoming overcast; sea, as before; tide, 5¼ hours ebb; barometer, 30·09; transparency, 2¼ fathoms.
					Cod,	1	39	1	33	1	31		
					,,	2	29	...	...	...	...		
					Whitings,	1	7	8	5	...	...		
					Pogge,	1	5	...	...	...	...		
					Herring,	1	5	...	...	...	...		
Station V. 6th Dec. 1892. 10.0 a.m. to 12.5 p.m.	S. 40·0	5·9	7·0 15 fath.	Surface Tow-net.—*Thysanoessa*, sp. f.; *Hyperoche*, sp. f.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, f.; *Caligus rapax*, r.; *Sagitta*, f.; Ctenphora, fr.	Plaice,	1	14	1	11	...	...	*Eledon cirrhosa*, 1; *Asterias*, f.; *Amphidotus cordatus*, f.	At beginning—Wind N.W., force 5; weather, overcast; sea moderate; tide, near low water; barometer, 29·66;
					Common dabs,	1	9	1	8	3	7		
					,, ,,	5	5–6	...	...	...	...		
					Long rough dabs,	1	9	1	8	3	6		
					,, ,,	1	5	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—II. ST ANDREWS BAY—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION V. 6th Dec. 1892. 10.0 a.m. to 12.5 p.m. —*continued.*	N. 41·0	5·4	7·0 14 fath.	Bottom Tow-net.—*Thysanoessa*, f.; *Hyperoche*, sp. r.; *Parathemisto*, sp. f.; *Calanus finmarchicus*, fr.; *Caligus rapax*, r.; *Sagitta*, c.; Ctenophora, f.	Haddocks, . .	45	5½–7	...	...	...	...		transparency, 3¾ fathoms. At finish.—Wind N., force 4; weather and sea, as before; tide, 2 hours flood; barometer, 29·68; transparency, 3¾ fathoms.
					Whitings, . .	1	8	1	5	...	...		
STATION VI. 21st Dec. 1892. 2.35 p.m. to 4.45 p.m.	N. 42·0	6·3	6·8 22 fath.	Surface Tow-net.—*Parathemisto*, sp. f.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, r.; *Sagitta*, f.; Ctenophora, f.	Grey skate, .	1	20	...	...	...	...	*Buccinum undatum*, v.r.; *Fusus antiquus*, v.r.; *Cancer pagurus*, f.; *Nephrops norvegicus*, r.; *Asterias*, c.; *Solaster papposa*, r.; *Alcyonium*, r.	At beginning—Wind N.N.E., force light; weather, hazy; sea, slight easterly swell; tide, 5¼ hours flood; barometer, 30·0; transparency, 5½ fathoms. At finish—Wind N., force light; weather and sea as before; tide, 1¼ hour ebb; barometer, 30·0; transparency (too dark to see).
					Starry ray, . .	1	12	...	...	...	...		
					Plaice, . .	1	18	1	15	2	14		
					,, . .	2	11–12	...	...	...	...		
					Lemon soles, .	1	15	1	14	1	7		
	S. 42·0	6.3	6·8 25¼ fath.	Bottom Tow net.—*Thysanoessa*, sp. fr.; *Mysis*, sp. f.; *Erythrops*, f.; *Diastylis*, f.; *Parathemisto*, f.; *Calisoma armata*, r.; *Calanus finmarchicus*, fr.; *Sagitta*, c.	Common dabs, .	1	10	2	9	1	5		
					Long rough dabs,	1	11	2	9	13	8		
					,, ,,	7	6	...	...	...	...		
					Haddocks, . .	1	16	3	14–15	2	9		
					,, . .	28	5–6	...	...	...	...		
					Cod, . . .	1	35	2	24–26	2	16–18		
					,, . . .	4	12–13	...	...	...	...		
					Whitings, . .	1	6	4	5	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—III. MONTROSE.

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION. I. 10th Sept. 1892. 6.55 a.m. to 8.20 a.m.	E. 52·5	11·7c	11·9c 17 fath.	Surface Tow-net. — *Acartia longiremis*, f.; young Crustacea, f.; *Plutei* and Infusoria, fr. Bottom Tow-net. — *Cancer paguris* (juv.), v. r.; *Pandalus annulicornis*, r.; *Diastylis*, sp. fr.; *Ampelisca*, and other Amphipoda, f.; *Temora longicornis*, f.; young Crustacea, fr.; a quantity of shelly sand.	Plaice,	13	13-14	19	12	5	10	*Loligo* (juv.), fr.; *Hyas araneus*, r.; *Portunus holsatus*, fr.; *Eupagurus bernhardus*, f.; *Asterias rubens*, f.; *Ophiothrix rosula*, f.; *Actinoloba dianthus*, f.; *Alcyonium*, fr.; *Aurelia*, f.	At beginning—Wind W., force 2; weather, clear; sea, slight; tide, 4¼ hours ebb; barometer, 28·86; transparency, 6 fathoms. At finish—Wind W., force 3; weather, sea, as before; tide, 5 hours ebb; barometer, 29·89; transparency, 6 fathoms.
					,,	6	8	...	...	...	...		
					Common dabs,	10	8	17	7	28	5½		
					,, ,,	15	4	...	...	...	...		
	W. 56·0	11·7	11·9 10 fath.		Long rough dabs,	1	13	1	12	1	11		
					,, ,,	4	8-9	...	...	...	...		
					Haddocks,	3	11-12	10	9	4	7–8		
					,,	26	4–5	...	...	...	...		
					Whitings,	11	9	11	8	4	5		
					,,	8	4	...	...	...	...		
					Gurnards,	1	15	1	14	3	13		
					,,	7	10	...	...	...	...		
					Dragonet,	1	7	2	6	...	...		
					Pogge,	1	...	...	...	...	...		
STATION II. 10th Sept. 1892. 5.10 a.m. to 6.10 a.m.	W. 50·5	11·7c	11·9c 5 fath.	Surface Tow-net.—*Hyperia*, sp. fr.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Acartia longiremis*, f.; *Sagitta*, f.; Ctenophora, f.; *Aurelia*, r.; young Crustacea, f. Bottom Tow-net. —*Mysis*, sp. f.; *Pseudocuma cercaria*, and *Diastylis*, sp. fr.; Amphipods (*Bathyporeia*, *Atylus*, *Ampelisca*, *Hyperia*, *Caprella*, &c.), c.; *Asterias*, v. r.; *Ophiurids*, c.; Copepoda (*Temora*, &c.), fr.; *Sagitta*, f.; Annelids [*sabella* ?), with their sand-tubes, f.; a quantity of shelly sand.	Thornback rays,	1	13	1	8	...	...	*Buccinum undatum*, r.; *Eledone cirrhosa*, v. r.; *Portunus holsatus*, fr.; *Asterias*, f.; *Aphrodite aculeata*, v. r.; *Cyanea* and *Aurelia*, fr.	At beginning—Wind N.W., force 2; weather, cloudy; sea, slight; tide, 1½ hours ebb; barometer, 29·83; transparency, 4½ fathoms. At finish—Wind N.W., force 2; weather, moderately clear; sea, slight; tide, 2½ hours ebb; barometer, 29·8; transparency, 5½ fathoms.
					Plaice,	7	12	12	10	5	7		
					,,	4	6	...	...	...	...		
					Common dabs,	2	10–11	11	9	45	7		
					,, ,,	43	4–5	...	...	...	...		
					Haddocks,	2	10	3	9	4	6		
	E. 54·0	11·5c	11·8c 14 fath.		,,	30	5	...	...	...	...		
					Whitings,	3	9	1	7	9	4-5		
					,,	1	3	...	...	...	...		
					Gurnards,	2	12–13	5	9–10	1	7		
					,,	2	5	...	...	...	...		
					Pogge,	2	5	1	5½	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—IV. ABERDEEN.

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 8th Sept. 1892 1.0 p.m. to 3.15 p.m.	S. 53·6	53·1	53·2 12 fath.	Surface Tow-net.—*Hyperoche*, sp. f.; *Temora longicornis*, f.; *Acartia longiremis*, fr.; Ctenophora, ab.; young Crustacea, fr.	Plaice, . .	1	24	17	16–17	15	14	Young *Loligo*, f.; *Portunus holsatus*, fr.; *Eupagurus bernhardus*, f.; *Actinoloba dianthus*, r.; *Alcyonium*, r.; large Medusæ (*Aurelia cyanea*), fr.	At beginning — Wind S.E., force 1; weather, cloudy, fine; sea, slight, slight easterly swell; tide, 5 hours flood; barometer, 30·0; transparency, 4 fathoms. At finish — Wind S.S.E., force 3; weather, sea, as before; tide, 1 hour ebb; barometer, 30·0; transparency, 3 fathoms.
					,, . .	4	11	...	...	...	...		
					Common dabs, .	4	9	66	7–8	65	5		
					,, ,, .	53	4	...	...	...	...		
					Long rough dabs,	3	11	5	9–10	3	8		
					,, ,, .	2	5½	...	...	...	...		
	N.54·0	52·9	53·4 12 fath.	Bottom Tow-net. — *Mysis spiritus*, ab.; *M. inermis*, r.; *Diastylis*, sp. fr.; *Pseudocuma cercaria*, c.; *Atylus*, sp. c.; *Hyperoche*, f.; *Calanus finmarchicus*, f.; *Temora longicornis*, fr.; *Acartia longiremis*, f.; *Sagitta*, c.; young Crustacea, c.	Haddocks, . .	2	15–18	4	14	52	10–11		
					,, . .	31	6–9	...	...	...	...		
					Cod, . .	35	11–12	34	10	25	9		
					,, . .	3	7	...	...	...	...		
					Whitings, . .	1	13	3	10–11	10	9		
					,, . .	8	7	...	...	...	...		
					Horse mackerel (*Caranx trachurus*), . .	1	14	...	...	...	...		
					Gurnards, . .	1	11	16	8–9	9	6–7		
					,, . .	22	5	...	...	...	...		
					Anglers, . .	1	18	1	15	1	12		
					,, . .	1	9	...	...	...	...		
STATION II. 8th Sept. 1892. 3.40 p.m. to 5.10 p.m.	W. 54·0	53·1	53·4 7 fath.	Surface Tow-net.—*Hyperia* associated with *Aurelia*, several *Hyperoche*, sp. r.; Ctenophora, f.; young Crustacea, f.; young fish, v. r.	Plaice, . .	2	15	7	12–13	2	9	*Portunus holsatus*, fr.; *Asterias*, r.; *Aurelia*, r.	At beginning—Wind S.S.E., force 3; weather, cloudy; sea, slight, slight easterly swell; tide, 1½ hours ebb; barometer, 30·0; transparency, 3 fathoms. At finish — Wind
					,, . .	1	8	...	...	...	...		
					Common dabs, .	5	9	93	8	57	7		
					,, ,, .	144	4–5	...	...	...	...		
	E. 53·4	52·7	53·2 18½ fath.	Bottom Tow-net. — *Mysis spiritus*, f.; *Pseudocuma cercaria*, fr.; *Atylus*, sp. f.; *Hyperoche*, sp. r.; *Calanus*	Haddocks, . .	1	14	2	10	17	6		
					Cod, . . .	2	11	...	...	...	...		
					Whitings, . .	1	12	1	9	9	8		
					,, . .	6	7	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—IV. ABERDEEN—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 8th Sept. 1892. 3.40 p.m. to 5.10 p.m. —*continued.*				*finmarchicus*, f.; *Temora longicornis*, f.; *Acartia longiremis*, f.; *Caligus*, r.; *Sagitta*, f.; Ctenophora, f.; young Crustacea, fr.; young flat fish, 1.	Gurnards, . .	1	13	1	9	4	8		E.S.E., force 2; weather, moderately clear; sea, slight; tide, 3¼ hours ebb; barometer, 29·99; transparency, 5 fathoms
						5	5	...	...	...	...		
STATION III. 9th Sept. 1892. 1.35 p.m. to 3.0 p.m.	W. 56·0	11·7c	11·6c 11 fath.	Surface Tow-net.—*Hyperoche*, r.; *Calanus finmarchicus*, r.; *Temora longicornis*, r.; *Acartia longiremis*, f.; young Crustacea, f.; fish ova, 3. Bottom Tow-net. — Contained a considerable quantity of fine sand mixed with shelly debris, amongst which were many *Mysis*, *Pseudocuma*, *Diastylis*, Amphipods *Sagitta*, &c.	Plaice, . .	1	14	...	...	...	...	*Loligo* (juv.), r.; *Portunus holsatus*, f.; *Eupagurus bernhardus*, r.; *Asterias rubens*, f.; *Aurelia aurita* (sev. of which sheltered *Hyperiæ*), c.	At beginning—Wind S., force, 3; weather, dull; sea, slight; tide, 4¾ flood; barometer, 29·82; transparency, fathoms. At finish—Wind S., force 2; weather, sea, as before; tide, 5¾ hours flood; barometer, 29·8; transparency, 4 fathoms.
					Long rough dabs,	1	7	...	...	...	...		
					Haddocks, . .	1	11	2	9	...	...		
					Cod, . . .	2	11	...	...	...	...		
					Whitings, . .	2	9	2	4½	...	...		
	E. 54·0	11·6c	11·8c 18 fath.		Gurnard, . .	1	5	...	...	...	...		
STATION IV. 9th Sept. 1892. 10.5 a.m. to 11.30 a.m.	N. 55·7	11·0	11·8 10½ fath.	Surface Tow-net.—*Hyperoche*, sp. f.; *Pleurobrachia*, c.; young Crustacea, f.; fish ova, 1. Bottom Tow-net.—*Mysis spiritus*, fr.; *Pseudocuma cercaria*, fr.; *Atylus*, sp. f.; *Hyperoche*, sp. f.; *Calanus finmarchicus*, r.; *Temora longicornis*,	Plaice, . .	11	16–18	19	14	61	11–12	*Portunus holsatus*, fr. This haul consisted of fish, and of little else. This station was trawled yesterday, but owing to the large quantity of fish (chiefly round fish) captured and to the net being some-	At beginning — Wind S., force 2; weather, fine, slight haze; sea, slight; tide, 1¼ hours flood; barometer, 29·85; transparency, 3 fathoms. At finish—Wind S., force 3; weather,
					,, . . .	28	7½–9	...	...	...	...		
					Common dabs, .	6	11–12	29	9½	528	7–8		
					,, ,,	917	4-6	...	...	...	...		
	S. 55·6	11·7	11·9 9½ fath.		Turbot, . .	1	23	...	...	...	...		
					Haddocks, . .	6	18–20	5	13–15	73	9–10		
					,, . .	20	5	...	...	...	...		
					Cod, . . .	3	11	1	10	1	9		
					Whitings, . .	3	11–12	31	10	13	8		
					,, . .	7	5	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—IV. Aberdeen—*continued*.

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Station IV. 9th Sept. 1892. 10.5 a.m. to 11.30 a.m. —*continued*.				fr.; *Caligus*, r.; *Sagitta*, f.; *Pleurobrachia*, fr.; young Crustacea, f.; post-larval fish, fr. (chiefly young sand-eels).	Gurnards, . .	2	10	5	9	16	8	what chafed from being in use for some time, the cod-end of the net split open as it was being lifted on board by means of the gantling, and all but a few of the fish were lost. Judging by the bulk of the fish in the net before it split, this was the largest haul that has yet been captured by the Garland's trawl-net.	dull; sea, slight; tide, 2¾ hours flood; barometer, 29·83; transparency, 3 fathoms.
						25	5–6	...	...	...	...		
Station V. 7th Sept. 1892. 10.10 a.m. to 11.50 a.m.	N. 55·5	53·1	53·8 10 fath.	Surface Tow-net.—*Hyperia*, sp. r.; *Hyperoche*, r.; *Centropages*, sp. f.; Ctenophora, f.; *Plutei* and Infusoria, fr.	Thornback ray, .	1	12	...	...	...	...	*Portunus holsatus*, f.; *Ophiurids*, f.; *Alcyonium*, f.; large Medusidæ, chiefly *Aurelia*, f.; some weed.	At beginning — Wind S.S.W., force 2; weather, hazy; sea, south easterly swell; tide, 2¼ hours flood; barometer, 29·84; transparency, 3 fathoms. At finish—Wind, S., force 4, weather, sea, as before; tide, 4 hours flood; barometer, 29·82; transparency, 2½ fathoms.
					Plaice, . .	5	16	17	14	33	9–11		
					,, . .	10	6	...	...	...	...		
					Common dabs, .	5	11–12	298	8–10	54	6		
					,, ,, .	23	5	...	...	...	...		
	S. 54·0	52·9	53·4 7½ fath.	Bottom Tow-net. — *Mysis*, sp. r.; *Pseudocuma cercaria*, fr.; *Hyperoche*, sp. r.; *Temora longicornis*, fr.; *Acartia*, sp. f.; *Caligus rapax*, fr.; *Sagitta*, f.; *Tomopteris*, r.; young Crustacea, fr.; young fish, r.	Flounder, . .	1	11	...	...	...	...		
					Haddocks, . .	2	18–19	8	15	10	13		
					,, . .	42	8	...	...	...	...		
					Cod, . . .	1	9	...	...	...	...		
					Whitings, . .	1	12	1	11	1	8		
					Gurnards, . .	2	13–14	22	10–11	2	7		
					,, . .	1	4	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—IV. ABERDEEN—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 7th Sept. 1892. 8 a.m. to 9.45 a.m.	N. 53·6	52·9	53·6 12 fath.	Surface Tow-net. — *Hyperia*, sp. r.; *Centropages*, sp. f.; Ctenophora, f.; *Plutei* and Infusoria, fr. Bottom Tow-net. — *Pseudocuma cercaria*, fr.; *Atylus*, sp. c.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Caligus*, sp. r.; Ctenophora, fr.; *Sagitta*, ab.; young Crustacea (*Mysis*, *Carida*, *Brachyura*), c.; young Annelides and Star-fishes, f.; post-larval fish, r.	Grey skates, . .	1	13	1	12	...	...	*Portunus holsatus*, f.; *Asterias rubens*, f.; *Alcyonium*, f.; *Aurelia aurita*, ab.; weed, Zoophytes, f.	At beginning — Wind S.S.E., light; weather, hazy; sea, calm; tide, low water; barometer, 29·87; transparency, 3 fathoms. At finish—Wind S.S.W., force 3; weather, hazy; sea, south easterly swell; tide, 1¾ hours flood; barometer, 54·0 transparency, 4 fathoms.
					Plaice, . .	1	17	14	14	11	13		
					,, . .	1	8	...	...	...	...		
					Common dabs, .	1	10	67	7-8	78	6		
	S. 54·0	52 9	53·2 14 fath.		,, ,, .	77	5	...	...	...	...		
					Turbot, . .	1	26	...	...	...	...		
					Haddocks, . .	1	13	1	11	12	8-9		
					,, . .	4	6	...	...	...	...		
					Whitings, . .	1	12	1	10	9	9		
					,, . .	1	4	...	...	...	...		
					Gurnards, . .	1	13	2	10	27	7-8		
					,, . .	18	6	...	...	...	...		
STATION VII. 6th Sept. 1892. 8.45 a.m to 11.0 a.m.	N. 66·0	52·7	53·2 28 faths.	Surface Tow-net.—*Parathemisto*, sp. f.; Ctenophora, f.; small young Crustacea, f. Bottom Tow-net.—*Mysis spiritus*, f.; *Pseudocuma cercaria*, ab., *Diastylis*, sp. f.; Amphipods (sp. ?), ab.; *Calanus finmarchicus*, f.; *Temora longicornis*, f.; *Caligus rapax*, r.; *Sagitta*, f.; Ctenophora, f.; a quantity of fragments of weed and Zoophytes.	Plaice, . .	2	19–20	2	14–15	1	13	*Hyas coarctatus*, f.; *Asterias rubens*, f.; *Alcyonium*, f.; *Alcyonidium*, *Flustra*, &c., fr.; *Aurelia* (with Hyperia, sp.), c.	At beginning—Wind S.S.W., force 2; weather, cloudy, fine; sea, strong easterly swell; tide, 3 hours flood; barometer, 30·08; transparency, 7 fathoms. At finish — Wind S.S.W., light; weather, sea, as before; tide, 5¼ hours flood; barometer, 30·10; transparency, 6 fathoms.
					,, . .	2	12	...	...	...	...		
					Common dabs, .	5	9–10	33	7–8	12	6		
	S. 61·5	53·1	53·2 34 fath.		,, ,, .	10	5	...	...	...	...		
					Brill, . .	2	16	...	...	...	...		
					Haddocks, . .	1	23	1	14	9	9–11		
					,, . .	2	6–8	...	...	...	...		
					Cod, . .	1	11	1	10	...	...		
					Gurnard, . .	1	8	...	...	...	...		
					Horse mackerel (*Caranx trachurus*).	1	14	...	...	...	...		

TABLE C.—Record of Observations made on Board the 'Garland' during 1892.—V. Moray Firth.

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
Smith Bank * 5th Sept. 1892 4.25 p.m. to 6.15 p.m.	S. 54·0	52·0	52·5 22 fath.	Surface Tow-net.—*Spirialis retroversus*, fr.; *Parathemisto*, sp. fr.; *Calanus finmarchicus*, f.; *Anomalocera patersoni*, r.; Ctenophora, fr.; small (young) Crustacea, fr.	Thornback rays, .	1	27	1	23	...	...	*Mytilus modiolus* (very large), fr.; *Tapes virginea*, r.; *Buccinum undatum*, fr.; *Fusus gracilis*, f.; *Ebolia*, sp. r.; *Hyas coarctatus*, f.; *Cancer pagurus*, r.; *Atelecyclus septemdentatus*, r.; *Eupagurus bernhardus* and *prideauxii*, f.; *Galathea*, sp. f.; *Asterias rubens*, f.; *Solaster endeca*, r.; *Astropecten irregularis*, f.; *Hippasterea*. *Echinus esculentus*, f.; *Spatangus purpureus*, fr.; *Cucumaria* (large brownish coloured), fr.; *Alcyonium* (very large, attached to stones and big mussels), ab.; *Antennaria ramosa*, f.	At beginning—Wind S.W. by S., force 3; weather, dull; sea, slight; tide 1¼ hours flood; barometer, 30·04; transparency, 6½ fathoms.
					Plaice, . .	1	24	1	20	2	16		
					Lemon soles, .	3	16	4	15	3	10		
					,, ,, .	5	7	...	...	...	...		
					Common dabs, .	2	7	26	6	5	5		
					Haddocks, . .	2	18	2	16–17	12	14		
					,, . .	7	11	...	...	...	...		
	E. 53·0	57·8	52·5 23 fath.	Bottom Tow-net.—A quantity of broken shells and shingle.	Cod, . . .	11	12	...	...	...	...		At finish—Wind as before; weather, dull, inclining to rain; sea, as before; tide, 3 hours flood; barometer, 30·01; transparency, 8½ fathoms.
					Gurnards, . .	42	11–12	52	9–10	10	7		
					Angler, . .	1	16	...	...	...	...		

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* Where trawl let down Ord of Caithness, west by north ½ north, Bin of Cullen, south by west ½ west. Steered north east by east one hour, and south 50 minutes.

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—V. MORAY FIRTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION I. 5th Sept. 1892.	W. 58·0	51·6	51·8 10 fath.	Surface Tow-net. — *Acartia longiremis*, f.; Ctenophora, f.; *Plutei* and Infusoria, fr.; fish ova, f. Bottom Tow-net. — *Calanus finmarchicus*, r.; Ctenophora, fr.	Thornback rays,	1	25	1	19	1	18	*Loligo vulgaris*, f.; *Astropecten irregularis*, r.; *Aurelia aurita*, f.; weed, Zoophytes, c.	At beginning — Wind W.S.W., force 3; weather, dull; sea, slight; tide near 1 hour ebb; barometer, 30·10; transparency, 4½ fathoms. At finish—Wind, weather, sea, as before; tide, 3 hours ebb; barometer, 30·10; transparency, 3 fathoms.
					Plaice,	4	21–22	8	19	25	13–16		
					,,	8	9–11	...	...	...	...		
					Lemon soles,	1	8	...	...	...	...		
	E. 57·0	51·8	52·3 9 fath.		Common dabs,	6	10–12	46	7½–9	17	6		
					,, ,,	21	4–5	...	...	...	...		
					Turbot,	1	27	1	19	...	...		
					Brill,	2	16	...	...	...	...		
					Haddocks,	1	20	1	15	1	13		
					,,	1	9	...	...	...	...		
					Cod,	4	11	2	10	...	...		
					Whiting,	1	9	...	...	...	...		
					Gurnards,	4	14	25	11–13	11	9		
					,,	1	6	...	...	...	...		
					Angler,	1	22	...	...	...	...		
STATION II. 5th Sept. 1892. 7.20 a.m. to 9.25 a.m.	W. 49	51·6	51·8 12 fath.	Surface Tow-net.—*Caligus rapax*, r.; Ctenophora, small Crustacea, fr. Bottom Tow-net. — Ctenophora, c.; young Crustacea, fr.	Thornback rays,	1	23	1	22	1	12	*Hyas coarctatus* and *araneus*, f.; *Cancer, pagurus*, r.; *Portunus holsatus*, fr.; *Nephrops norvegicus*, r.; *Asterias rubens*, f.; *Solaster papposa* and *endeca*, r.; *Echi-*	At beginning—Wind S.W., force 2; weather, dull; sea, slight; tide 4 hours flood; barometer, 30·10; transparency, 3½ fathoms. At finish—Wind S.W., force 3; weather, sea, as before; tide, high water; barometer,
					,, ,,	1	11	...	...	...	...		
					Plaice,	2	20	3	13–16	34	11		
					,,	42	7–8	...	...	...	...		
	E. 57·5	57·4	51·8 12 fath.		Lemon soles,	3	10	2	7	1	5		
					Common dabs,	7	8–9	32	7	30	6		
					,, ,,	31	3½–4½	...	...	...	...		
					Flounder,	1	8	...	...	...	...		
					Witch soles,	1	14	...	...	...	...		
					Long rough dabs,	2	10	1	9	1	7		
					Solenette,	1	3¾	...	...	...	...		
					Haddocks,	2	20	6	14–17	17	11–13		
					,,	24	8–9	4	4–5	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—V. MORAY FIRTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Sur-face.	Bot-tom.			No.	Inches	No.	Inches	No.	Inches		
STATION II. 5th Sept. 1892. 7.20 a.m. to 9.25 a.m. —*continued.*					Cod, . . .	4	10	1	8	...	...	*nus esculentus*, f.; *Alcyonium*, fr.; Actinidæ, fr.	30·11; transparancy, 3¼ fathoms.
					Whitings, . .	1	8	3	3	...	...		
					Gurnards, . .	1	9	1	8	7	7		
					Butter-fish, . .	1	6	1	4½	4	2–2¾		
STATION III. 1st Sept. 1892. 10.15 a.m. to 11.15 a.m.	W. 50	52·7	52·9 5 fath.	Surface Tow-net.—*Acartia longiremis*, fr.; *Pleurobrachia*, f.; *Plutei*, f.; Infusoria, fr. Bottom Tow-net. — *Pseudocuma cercaria*, fr.; *Atylus swammerdami*, (mostly young), c.; *Calanus finmarchicus*, r.; *Acartia longiremis*, f.; *Temora longicornis*, f.; *Parapontella brevicornis*, fr.; *Podon*, sp. fr.; *Pleurobrachia*, f.; young Crustacea, c.; young pipe fish, r.	Plaice, . .	2	15	3	14	12	12–13	*Pecten opercularis*, f.; *Buccinum undatum*, f.; *Mytilus modiolus*, fr.; *Loligo vulgaris*, f.; *Hyas araneus* and *coarctatus*, f.; *Portunus holsatus*, f.; *Eupagurus bernhardus*, f.; *Ophiothrix rosula*, f.; *Echinus esculentus*, f.; *Strongylocentrotus diobachiensis*, f.; *Spatangus purpureus*, f.; *Cucumaria*, sp. (large dark coloured), fr.; Zoophytes (Hydrozoa), f.; large Medusids, f.; a small quantity of weed.	At beginning — Wind W., force 3; weather, dull, with rain; sea, slight; tide, 3¾ hours ebb; barometer, 29·40; transparency, 2 fathoms. At finish—Wind W. by N., force 2; weather, dull; sea, smooth; tide, 4¾ hours ebb; barometer, 29·41; transparency, 1¼ fathoms.
					,, . .	3	10	...	...	...	...		
					Lemon soles, .	1	13	1	10	1	9		
					,, ,, . .	1	8	...	...	...	...		
	E. 53·9	52·1	53·2 13 fath.		Common dabs, .	1	9	1	5	...	...		
					Cod, . . .	2	10	3	9	2	8		
					Father-lasher, .	1	6	...	...	...	...		

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—V. MORAY FIRTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION IV. 2nd Sept. 1892. 11.10 a.m. to 1.25 p.	E. 52·5	52·3	52·5 11 fath.	Surface Tow-net.—*Pleurobrachia*, fr.; young Crustacea, fr.; Infusoria, fr. Bottom Tow-net.—Amphipods (*Metila*, sp. mostly), c.; *Pleurobrachia*, ab.; young Crustacea, fr.	Thornback rays, .	1	26	1	25	3	18½	*Mytilus edulis*, f.; *Portunus, holsatus* and *depurator*, c., *Asterias*, c.; *Astropecten irregularis*, f.; *Echinus esculentus*, fr.; Zoophytes, fr.; weed, v. ab. (about a cart load).	At beginning—Wind S.W., force 2; weather, cloudy; sea, slight; tide, 3½ hours ebb; barometer, 29·27; transparency, 4½ fathoms. At finish—Wind W., force 3; weather, sea, as before; tide near low water; barometer, 29·28 transparency, 4½ fathoms.
					,, ,, .	1	15	...	...	...	...		
					Plaice, . .	1	28	8	23–25	4	14–17		
					,, . .	51	11–12	500	7½–9½	330	5–6½		
	W. 55·0	52·3			Lemon soles, .	1	13	2	10	...	...		
					Common dabs, .	2	13–14	9	12	55	7½–9		
					,, ,, .	202	5–6	41	3½	...	...		
			52·5 8½ fath.		Flounders, . .	1	14	1	13	1	8		
					Solenette, . .	1	2⅛	...	...	...	...		
					Cod, . . .	1	2½	...	...	...	...		
					Haddock, . .	1	9	1	4	...	...		
					Gurnards, . .	6	10–11	2	7½	2	6		
					,, . .	1	3½	...	...	...	...		
					Anglers, . .	2	17	...	...	...	...		
					Father-lasher, .	1	5	...	...	...	...		
					Common pipe-fish,	4	5½	1	4	...	...		
STATION V. 2nd Sept. 1892. 9.0 a.m. to 10.30.m.	W. 52·6	51·4	52·3 12½ fath.	Surface Tow-net.—*Hyperoche*, sp. r.; *Acartia longiremis*, fr.; small Ctenophora, f.; young and larval decapoda, ab.; young fish, r.; fish ova, f. Bottom Tow-net.—*Pleurobrachia*, ab.; young fish, r.	Common dabs, .	2	7	1	6	1	3	*Mytilus edulis*, r.; *Stenorhynchus*, sp. r.; *Asterias rubens*, f.; large Medusidæ, chiefly *Aurelia aurita*, v. ab. The *Aurelia* were so numerous that when the trawl-net was emptied, they nearly covered the poop-deck.	At beginning—Wind westerly, light; weather, cloudy; sea, slight; tide, 1½ hours ebb; barometer, 29·30; transparency, 5 fathoms. At finish—Wind S.S.W., force 2; weather, sea, as before; tide, 3 hours ebb; barometer, 29·29; transparency, 4½ fathoms.
	E. 53·0	51·	52·3 17 fath.										

TABLE C.—RECORD OF OBSERVATIONS MADE ON BOARD THE 'GARLAND' DURING 1892.—V. MORAY FIRTH—*continued.*

Station, Date, and Time Trawl down.	Temperature.			Pelagic Fauna, Spawn, and young Fish.	Description of Take.	Number and Size of Fish.						Invertebrate Fauna, &c. brought up in Trawl Net.	Wind, Weather, and other Observations.
	Air.	Water.											
	Dry Bulb.	Surface.	Bottom.			No.	Inches	No.	Inches	No.	Inches		
STATION VI. 2nd Sept. 1892. 1.40 p.m. to 3.50 p.m.	W. 55·0 E. 53·0	52·5 52·2	52·3 10 fath. 52·5 16 fath.	Surface Tow-net. — *Mysis flexuosus*, r.; *Hyperoche*, sp. r.; *Calanus finmarchicus*, f.; *Acartia longiremis*, f.; *Evadne*, f.; small Ctenophora, c.; young Crustacea, c. Bottom Tow-net. — *Caprella*, sp. r.; *Hyperia galba*, fr.; *Aurelia*, fr.; small Ctenophora, ab.; young Crustacea, f.; young fish, r.	Thornback ray,	1	13	...	...	...	...	*Aurelia*, v. ab., the quantity of *Aurelia* was so great that the net had ruptured.	At beginning – Wind W.S.W., force 1; weather, cloudy; sea, slight; tide, low water; barometer, 29·28; transparency, 3 fathoms. At finish — Wind N.W., force 5; weather, as before; sea, moderate; tide, 2¼ hours flood; barometer, 29·28; transparency 4½ fathoms.,
					Plaice,	1	14	3	8	1	6		
					"	4	5	...	...	...	...		
					Common dabs,	1	7	4	5	1	4		

TABLE D.—ANSTRUTHER DISTRICT.—Buckhaven Haddock and Cod Line Fishing—Years 1891-92.

Months.	1891.								1892.							
	Number of Days Boats were out per Month.	Total Number of Shots per Month.	Haddocks and Whitings.		Number of Cod.	Average Number of Fish per Shot.			Number of Days Boats were out per Month.	Total Number of Shots per Month.	Haddocks and Whitings.		Number of Cod.	Average Number of Fish per Shot.		
			100's of Large.	100's of Small.		Haddocks and Whitings.		Cod.			100's of Large.	100's of Small.		Haddocks and Whitings.		Cod.
						Large.	Small.							Large.	Small.	
January, . .	24	276	188	123	642	87·1	57·04	2·32	18	131	59	16	377	57·64	15·63	2·87
February, . .	21	227	189	126	250	106·5	71·04	1·10	24	239	108	89	319	57·84	47·66	1·33
March, . . .	19	242	185	135	463	97·8	71·4	1·91	26	355	112	141	327	40·38	50·83	0·92
April, . . .	23	482	473	168	769	125·6	44·6	1·59	26	326	40	159	–	15·705	62·42	–
May, . . .	26	271	299	173	70	141·2	81·7	0·25	26	211	156	86	–	94·63	53·68	–
June, . . .	24	167	258	162	–	197·7	124·1	–	25	229	149	52	–	83·28	29·06	–
July, . . .	27	196	303	352	–	197·8	229·8	–	24	210	159	277	–	96·91	168·83	–
August, . .	24	201	129	290	–	82·1	184·6	–	23	201	50	301	36	31·84	191·68	0·17
September, . .	20	165	81	245	–	62·8	190·06	–	23	285	65	251	–	29·19	112·73	–
October, . .	25	436	297	279	–	87·19	81·9	–	22	482	120	232	10	31·86	61·61	0·02
November, . .	22	363	161	232	165	56·7	81·8	0·45	20	264	92	180	139	44·606	87·27	0·52
December, . .	24	270	111	107	670	52·6	50·7	2·4	27	179	109	86½	183	77·94	60·402	1·02
Totals for Year,	279	3296	2674	2392	3029	103·8	92·8	0·91	284	3112	1219	1870½	1391	50·13	76·93	0·44

Note.—'Large' fish are Haddocks only; 'Small' includes Whitings and (principally) Small Haddocks. One hundred fish is 32 warp or 128 fish. The total number of shots per month is ascertained by adding together the number of boats out each day.

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS DURING 1892, IN THE LEITH, ANSTRUTHER, MONTROSE, STONEHAVEN, AND ABERDEEN DISTRICTS.

Date.	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
1892	**Leith District.**	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s.	100s	cwt.	£
Jan.	I. Net and line boats,	10,573	175	1	–	2941	109	–	69	5290	220	9	–	2	123	12	124	442	2	1240	2269	–	419	135	8,045
	II. Steam beam trawlers,	–	–	–	–	2134	46	–	29	3856	569	151	–	124	238	2	49	1113	–	–	–	–	–	10	5,238
	Total,	10,573	175	1	–	5075	155	–	98	9146	789	160	–	126	361	14	173	1555	2	1240	2269	–	419	145	13,283
Feb.	I. Net and line boats,	5683	560	2¼	–	2650	130	–	99	4762	388	3	3	2	146	7	47	426	12	1425	2580	–	454	64	6,713
	II. Steam beam trawlers,	–	–	–	–	1326	19	–	9	2397	544	30	–	75	133	2	27	594	–	–	–	–	–	70	2,811
	Total,	5683	560	2¼	–	3976	149	–	108	7159	932	33	3	77	279	9	74	1020	12	1425	2580	–	454	134	9,524
March	I. Net and line boats,	5394	4136	2¾	–	3239	131	–	79	4238	371	7	6	1	401	12	38	520	12	2082	2252	$1\frac{34}{100}$	118	1901	7,296
	II. Steam beam trawlers,	–	–	–	–	812	37	–	8	4386	510	47	2	82	267	2	76	670	–	–	–	–	–	20	4014
	Total,	5394	4136	2¾	–	4051	168	–	87	8624	881	54	8	83	668	14	114	1190	12	2082	2252	$1\frac{34}{100}$	118	1921	11,310
April	I. Net and line boats,	822	595	9	–	4770	322	–	161	2928	378	12	26	8	335	28	328	1560	21	3695	2562	$3\frac{65}{100}$	1015	160	7756
	II. Steam beam trawlers,	–	–	–	–	3683	89	–	25	3074	510	119	2	286	497	1	289	1255	–	–	–	–	–	70	6172
	Total,	822	595	9	–	8453	411	–	186	6002	888	131	28	294	832	29	617	2815	21	3695	2562	$3\frac{65}{100}$	1015	230	13,928
May	I. Net and line boats,	567	–	–	–	5957	570	–	724	1522	255	5	311	10	428	19	866	1828	–	1010	288	$14\frac{33}{100}$	2647	304	8698
	II. Steam beam trawlers,	–	–	–	–	1321	48	–	12	3860	365	57	1	333	463	1	392	1268	–	–	–	–	–	80	4629
	Total,	567	–	–	–	7278	618	–	736	5382	620	62	312	343	891	20	1258	3096	–	1010	288	$14\frac{33}{100}$	2647	384	13,327

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date.	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
1892	**Leith District**—*continued.*	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s.	100s.	cwt.	£
June	I. Net and line boats, .	417	–	–	–	6205	1094	–	874	961	225	14	214	1	291	7	756	1296	–	914	240	$22\frac{29}{100}$	915·	156	6406
	II. Steam beam trawlers,	–	–	–	–	827	60	–	10	2432	212	55	1	402	709	1	618	607	–	–	–	–	–	-	3462
	Total, .	417	–	–	–	7032	1154	–	884	3393	437	69	215	403	1000	8	1374	1903	–	914	240	$22\frac{29}{100}$	915·	156	9,868
July	I. Net and line boats,	3231	–	–	–	445	12	–	9	1155	204	5¼	2	1	281	-	122	480	–	1223	40	$3\frac{53}{100}$	362·	328	2572
	II. Steam beam trawlers,	–	–	–	–	1181	32	–	7	7442	342	126	–	352	625	–	264	1172	–	–	–	–	–	80	4777
	Total, .	3231	–	–	–	1626	44	–	16	8597	546	131¼	2	353	906	–	386	1652	–	1223	40	$3\frac{53}{100}$	362·	408	7349
August	I. Net and line boats, .	3696	–	–	–	250	20	–	3	775	217	2	1	1	265	–	23	115	–	10 60	246	$4\frac{4}{100}$	413·	313	2046
	II. Steam beam trawlers,		–	–	–	781	20	3	18	7335	292	63	–	399	563	–	131	1070	–	–	–	–	–	60	5239
	Total, .	3696	–	–	–	1031	40	3	21	8110	509	65	1	400	828	–	154	1185	–	1060	246	$4\frac{4}{100}$	413·	373	7285
Sept.	I. Net and line boats, .	–	–	1½	–	149	3	–	2	930	134	1	5	1	443	15	22	89	–	2912	412	$4\frac{25}{100}$	303·	263	1803
	II. Steam beam trawlers,	–	–		–	943	16	–	6	6881	656	58	2	512	1023	3	532	1364	–	–	–	–	–	–	6509
	Total, .	–	–	1½	–	1092	19	–	8	7811	790	59	7	513	1466	18	554	1453	–	2912	412	$4\frac{25}{100}$	303·	263	8312
Oct.	I. Net and line boats, .	66	2	3	–	360	4	–	12	3523	361	1	–	5	622	32	121	578	23	5250	1611	$4\frac{8}{100}$	385·	261	4505
	II. Steam beam trawlers,	–	–	–	–	638	22	–	25	6321	415	55	2	400	865	4	785	1741	–	–	–	–	–	60	6763
	Total, .	66	2	3	–	998	26	-	37	9844	776	56	2	405	1487	36	906	2319	23	5250	1611	$4\frac{8}{100}$	385·	321	11,368

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date.	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	(Torsk Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
		cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s.	100s.	cwt.	£
1892	**Leith District**—*continued.*																								
Nov.	I. Net and line boats, .	578	160	4	–	1142	41	–	41	2469	110	2	–	1	295	51	124	258	82	844	3757	$6\frac{4}{100}$	618·	255	4704
	II. Steam beam trawlers,	–	–	–	–	1146	23	–	74	5274	185	44	–	365	471	16	238	1024	–	–	–	–	–	–	5298
	Total, .	578	160	4	–	2288	64	-	115	7743	295	46	–	366	766	67	362	1282	82	844	3757	$6\frac{4}{100}$	618·	255	10,002
Dec.	I. Net and line boats, .	8629	197	1	–	1632	55	–	36	2476	97	11	2	1	116	32	162	1905	36	731	2341	$1\frac{29}{100}$	501·	241	7,544
	II. Steam beam trawlers,	–	–	–	–	1287	27	–	14	3275	68	45	–	189	348	3	141	721	–	–	–	–	–	–	3,852
	Total, .	8629	197	1	–	2919	82	–	50	5751	165	56	2	190	464	35	303	2626	36	731	2341	$1\frac{29}{100}$	501·	241	11,396
Whole year.	I. Net and line boats, .	39,936	5825	23½	–	29,734	2491	–	2109	40,022	2957	72¼	570	34	3748	215	2733	9496	188	22,161	9818	$64\frac{84}{100}$	8192·	4344	68,188
	II. Steam beam trawlers,	–	–	–	–	17,079	429	3	237	56,533	4668	850	10	3518	6202	35	3542	12,599	–	–	–	–		450	58,764
	Total, .	39,936	5825	23½	–	46,813	2920	3	2346	96,555	7625	922¼	580	3552	9950	250	6275	22,095	188	22,161	9818	$64\frac{84}{100}$	8192·	4794	126,952

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
	Anstruther District.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s.	100s.	cwt.	£
1892 January	By net and line boats,	1932	–	30	–	2720	71	–	18	3436	105	–	3	–	24	13	45	–	–	2524	75	7·50	–	30	4254
February	,, ,,	10,129	–	8	–	3855	138	–	27	2978	117	1	24	–	512	3	112	10	–	3010	136	·50	61	30	6352
March	,, ,,	6784	–	–	–	3109	311	–	54	4013	231	4	21	–	487	4	183	20	–	3911	285	3·95	190	66	5501
April	,, ,,	538	–	–	–	4688	559	–	130	1924	130	3	83½	–	67	–	359	–	–	4436	140	48·00	1970	162	5072
May	,, ,,	205	–	–	–	2,050	1470	–	2065	2617	309	3	108½	–	153	–	566	40	–	3460	–	36·14	3869	100	8295
June	,, ,,	115	–	–	–	10,938	1065	–	2261	2513	279	6	207	–	199	–	501	54	–	4040	–	21·00	1750	70	6432
July	,, ,,	4864	–	–	–	267	–	–	–	1248	134	–	–	–	135	–	–	2	–	2537	–	2·09	575	70	1936
August	,, ,,	8518	–	–	–	173	–	–	–	1014	138	–	–	–	103	2	–	26	–	2489	–	6·53	516¾	124	2159
September	,, ,,	17	–	42½	–	214	–	–	–	1273	157	–	–	–	309	10	–	–	–	10,095	120	38·58	80	17	2246
October	,, ,,	–	–	65	–	684	4	–	–	1963	75	–	–	–	206	19	45	55	–	5987	540	60·55	21½	42	2704
November	,, ,,	39	–	40	–	1055	28	–	8	2443	50	–	2	½	74	7	70	–	–	5308	375	53·34	10	30	2784
December	,, ,,	1988	–	24	–	2814	122	–	18	2943	73	–	3	–	30	37	191	–	–	3392	220	35·93	8¾	100	4568
Whole year	,, ,,	35,129	–	209½	–	42,567	3768	–	4581	28,365	1798	17	452	½	2299	95	2072	207	–	51,189	1891	314·11	9052	841	52,303

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date.	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole)	Flounder, Plaice, Brill	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
1892	**Montrose District—**	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s.	100s.	cw .	£
Jan.	I. Net and line boats, .	1986	–	–	–	410	4	–	4	7042	79	–	–	1	70	5	5	1468	–	4933	–	¼	–	245	6039
	II. Steam beam trawlers,	–	–	–	–	137	6	–	4	447	34	15	1	39	91	1	36	154	–	–	–	–	–	–	746
	Total, .	1986	–	–	–	547	10	–	8	7489	113	15	1	40	161	6	41	1622	–	4933	–	¼	–	245	6785
Feb.	I. Net and line boats, .	543	–	–	–	307	9	–	9	10,771	93	–	–	1	255	–	4	1049	–	4775	–	1½	–	88	7196
	II. Steam beam trawlers,	–	–	–	–	126	11	–	–	409	5	7	2	51	310	–	36	180	–	–	–	–	–	–	735
	Total, .	543	–	–	–	433	20	–	9	11,180	98	7	2	52	565	–	40	1229	–	4775	–	1½	–	88	7931
March	I. Net and line boats, .	–	–	–	–	280	8	–	5	5774	53	–	–	1	534	–	5	1197	–	5423	–	29	8	127	4835
	II. Steam beam trawlers,	–	–	–	–	197	10	–	8	647	17	10	2	46	436	–	36	145	–	–	–	–	–	–	939
	Total, .	–	–	–	–	477	18	–	13	6421	70	10	2	47	970	–	41	1342	–	5423	–	29	8	127	5774
April	I. Net and line boats, .	5	–	–	–	887	38	–	15	5493	146	–	2	3	319	–	17	905	–	3470	–	49	678	139	5665
	II. Steam beam trawlers,	–	–	–	–	142	28	–	–	534	17	19	3	118	242	–	35	200	–	–	–	–	–	–	862
	Total, .	5	–	–	–	1029	66	–	15	6027	163	19	5	121	561	–	52	1105	–	3470	–	49	678	139	6527
May	I. Net and line boats, .	343	–	–	–	3218	151	–	301	6428	344	–	72	–	62	2	299	942	–	3200	–	34¼	1057½	197	6634
	II. Steam beam trawlers,	–	–	–	–	81	6	–	4	529	27	17	37	156	176	–	44	211	–	–	–	–	–	–	838
	Total, .	343	–	–	–	3299	157	–	305	6957	371	17	109	156	238	2	343	1153	–	3200	–	34¼	1057½	197	7472

TABLE E.—Showing Fish Landed by Net and Line Boats and by Steam Beam Trawl Boats—*continued.*

Date.	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
	Montrose District—*continued.*	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cw .	100s.	100s.	cwt.	£
1892 June	I. Net and line boats,	126	–	–	–	5485	384	40	1195	7701	251	4½	182	1	250	–	1122	1144	–	2510	–	19¾	513·	88	6886
	I. Steam beam trawlers,	–	–	–	–	105	11	–	10	816	10	15½	2	168	166	–	32	244	–	–	–	–	–	–	948
	Total,	126	–	–	–	5590	395	40	1205	8517	261	20	184	169	416	–	1154	1388	–	2510	–	19¾	513·	88	7834
July	I Net and line boats,	57,446	–	–	–	246	4	–	4	3335	258	½	–	–	97	10	5	401	–	1640	–	7¼	174·	60	14,115
	II. Steam beam trawlers,	–	–	–	–	66	5	–	6	1008	40	16	1	127	138	–	63	164	–	–	–	–	–	–	926
	Total,	57,446	–	–	–	312	9	–	10	4343	298	16½	1	127	235	10	68	565	–	1640	–	7¼	174·	60	15,041
August	Net and line boats,	82,068	–	–	10	52	4	–	4	1157	45	–	–	–	81	20	3	253		1705	–	4¾	44¼	57	13,022
	II Steam beam trawlers,	–	–	–	–	104	10	–	11	2459	50	63	2	160	191	4	18	653	–	–	–	–	–	–	1930
	Total,	82,068	–	–	10	156	14	–	15	3616	95	63	2	160	272	24	21	906		1705	–	4¾	44¼	57	14,952
Sept.	I Net and line boats,	–	–	1½	4	62	5	–	4	4243	218	–	–	1	304	–	5	604	–	3792	–	10½	21	203	3888
	Steam beam trawlers,	–	–	–	–	82	6	–	13	1486	44	28½	–	96	350	–	69	329	–	–	–	–	–	–	1486
	Total,	–	–	1½	4	144	11	–	17	5729	262	28½	–	97	654	–	74	933	–	3792	–	10½	21	203	5374
Oct.	I. Net and line boats,	165	–	4	5	114	5	–	53	4831	135	–	–	2	169	–	5	1377	–	1937	–	4¾	3	270	4480
	II Steam beam trawlers,	–	–	–	–	36	5	–	8	569	25	14	–	79	688	–	57	415	–	–	–	–	–	–	1290
	Total,	165	–	4	5	150	10	–	61	5400	160	14	–	81	857	–	62	1792	–	1937	–	4¾	3	270	5770

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued*.

Date.	District.	Herring.	Sprat.	Sparling	Mackerel	Cod	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
	Montrose District—*continued.*	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s.	100s.	cwt.	£
1892 Nov.	I. Net and line boats, .	218	30	–	–	234	20	–	4	5077	68	–	–	4	59	2	9	1479	–	3346	–	–	–	441	4589
	II. Steam beam trawlers,	–	–	–	–	67	9	–	–	886	9	17	–	129	173	2	32	387	–	–	–	–	–	–	1191
	Total, .	218	30	–	–	301	29	–	4	5963	77	17	–	133	232	4	41	1866	–	3346	–	–	–	441	5780
Dec.	I. Net and line boats, .	457	7	1½	–	923	24	–	3	4355	57	1	–	3	77	18	33	1266	–	4001	–	1	–	450	4740
	II. Steam beam trawlers,	–	–	–	–	298	12	–	3	796	5	25½	1	103	190	–	46	380	–	–	–	–	–	–	1210
	Total, .	457	7	1½	–	1221	36	-	6	5151	62	26½	1	106	267	18	79	1646	–	4001	–	1	–	450	5950
Whole year.	I. Net and line boats, .	143,357	37	7	19	12,218	656	40	1601	66,207	1747	6	256	17	2277	57	1512	12,085	–	40,732	–	161¼	2498¾	2365	82,089
	II. Steam beam trawlers,	–	-	–	–	1441	119	–	67	10,586	283	247½	51	1272	3151	7	504	3462	–	–	–	–	–	–	13,101
	Total, .	143,357	37	7	19	13,659	775	40	1668	76,793	3030	253½	307	1289	5428	64	2016	15,547	–	40,732	–	161¼	2498¾	2365	95,190

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date.	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
	Stonehaven District.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s.	100s.	cwt.	£
1892 January	By net and line boats,	327	–	–	–	720	22	–	3	2573	30	–	1	–	4	10	–	22	–	–	–	–	–	27	1945
February	,, ,,	609	–	–	–	734	21	–	7	3070	66	2	8	–	8	13	–	17	–	–	–	–	–	60	2374
March	,, ,,	–	–	–	–	814	1	–	–	1950	94	½	–	–	23	–	1	4	–	–	–	0·44	17·91	87	1203
April	,, ,,	–	–	–	–	1282	152	–	57	1374	201	1½	19½	–	24	–	110	3	–	–	–	2·78	378·00	45	1682
May	,, ,,	42	–	–	–	1268	87	–	147	1679	325	5	12	–	14	–	65	20	–	–	–	6·40	549·70	15	1909
June	,, ,,	949	–	–	–	2078	130	–	488	1008	159	6	48	–	12	–	95	20	–	–	–	7·40	262·00	20	1771
July	,, ,,	22,235	–	–	–	69	–	–	2	574	341	–	–	–	6	9	4	40	–	–	–	2·37	121·28	20	4032
August	,, ,,	23,268	–	–	–	174	–	–	–	326	350	–	–	–	29	2½	–	52	–	–	–	1·51	123·30	15	3880
September	,, ,,	151	–	–	–	789	–	–	–	1826	432	–	–	–	34	2½	–	47	–	–	–	0·63	153·10	62	1275
October	,, ,,	2	–	–	–	962	–	–	–	1150	117	–	–	–	81	1	–	37	–	24	–	0·10	32.12	54	1259
November	,, ,,	–	–	–	–	719	4	–	–	1271	20	–	1	–	50	5	2	39	–	20	–	–	11·00	50	1079
December	,, ,,	1302	–	–	–	927	53	–	18	1145	12	2	5½	–	6	61	28	58	–	10	–	–	–	23	1584
Whole year	,, ,,	48,885	–	–	–	10,536	470	–	722	17,946	2147	17	95	–	291	104	305	359	–	54	–	21·63	1648·41	478	23,993

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date.	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk. (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
1892	**Aberdeen District.**	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s	100s.	cwt.	£
Jan.	I. Net and line boats,	169	–	–	–	1707	260	–	75	2925	83	1	13	–	–	3	87	558	–	–	–	–	–	–	4504
	II. Steam beam trawlers,	–	–	–	–	1148	186		28	7781	115	75	3	397	2191	9	119	1291	–	–	–	–	6	–	11,742
	Total,	169	–	–	–	2855	446	–	103	1,0706	198	76	16	397	2191	12	206	1849	–	–	–	–	6	–	16,246
Feb.	I. Net and line boats,	54	–	–	–	1884	722	–	21	6337	179	2	45	–	2	2	107	355	–	–	–	–	–	–	5688
	II. Steam beam trawlers,	–	–	–	–	2356	196	–	46	10,489	90	161	3	769	5147	3	126	1435	–	–	–	–	–	–	16,108
	Total,	54	–	–	–	4240	918	–	67	16,826	269	163	48	769	5149	5	233	1790	–	–	–		–	–	21,796
March	I. Net and line boats,	–	–	–	–	2164	1015	9	56	4667	156	5	290	1	34	1	304	300	–	–	–	$\frac{1}{10}$	–	–	4845
	II. Steam beam trawlers,	–	–	–	–	2988	223	–	12	19,477	197	119	12	1253	2238	–	122	1869	–	–	–	–	–	–	20,571
	Total,	–	–	–	–	5152	1238	9	68	24,144	353	121	302	1254	2272	1	426	2169	–	–	–	$\frac{1}{10}$	–	–	25,416
April	I. Net and line boats,	236	–	–	–	6047	1813	47	377	4294	393	2	1433	–	14	–	1152	229	–	–	–	$1\frac{1}{10}$	–	–	9376
	II. Steam beam trawlers,	–	–	–	–	2279	341	–	8	9665	138	184	11	2032	1385	–	207	2046	–	–	–	–	–	–	13,400
	Total,	236	–	–	–	8326	2154	47	385	13,959	531	186	1444	2032	1399	–	1359	2275	–	–	–	$1\frac{1}{10}$	–	–	22,776
May	I. Net and line boats,	445	–	–	–	9941	1373	113	1894	4380	472	8	2133	–	–	–	1072	311	–	–	–	4	17½	–	10,381
	I. Steam beam trawlers,	–	–	–	–	1096	164	–	22	6324	90	119	3	2169	1477	–	132	1684	–	–	–	–	–	–	11,003
	Total,	445	–	–	–	11,037	1537	113	1916	10,704	562	127	2136	2169	1477	–	1204	1995	–	–	–	4	17½	–	21,384

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date	District.	Herring.	Sprat.	Sparling.	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
1892	**Aberdeen District**—*continued.*	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt	cwt.	100s	100s.	cwt.	£
June	I. Net and line boats,	1843	–	–	–	9532	1134	60	2449	4584	804	9	2655	–	13	3	1120	149	–	–	–	3½	42	–	10,137
	II. Steam beam trawlers,	–	–	–	–	881	105	–	117	6328	67	139	2	1661	1910	–	33	1314	–	–	–	–	–	–	9189
	Total,	1843	–	–		10,413	1239	60	2566	10,912	871	148	2657	1661	1923	3	1153	1463	–	–	–	3½	42	–	19,326
July	I. Net and line boats,	177,758	–	–	–	1832	710	31	230	1391	1588	3	1994	–	11	4	431	45	–	–	–	–	48½	–	27,069
	II. Steam beam trawlers,	–	–	–	–	1506	178	–	536	6794	186	143	15	1732	2176	3	80	1529	–	–	–	–	–	–	9965
	Total,	177,758	–	–	–	3338	888	31	766	8185	1774	146	2009	1732	2187	7	511	1574	–	–	–	–	48½	–	37,034
August	I. Net and line boats,	191,705	–	–	–	875	1313	47	–	778	1792	–	1992	–	13	–	332	23	–	–	–	–	92	–	26,787
	II. Steam beam trawlers,	–	–	–	–	1259	109	–	98	13,246	195	376	–	2811	2409	6	84	1983	–	–	–	–	–	–	14,219
	Total,	191,705	–	–	–	2134	1422	47	98	14,024	1987	376	1992	2811	2422	6	416	2006	–	–	–	–	92	–	41,006
Sept.	I. Net and line boats,	3048	–	–	–	283	434	30	32	2782	1305	–	762	–	106	11	369	29	–	–	–	–	66½	–	4658
	II. Steam beam trawlers,	–	–	–	–	1285	60	–	227	16,445	313	288	1	1662	2296	2	157	1976	–	–	–	–	–	–	17,711
	Total,	3048	–	–	–	1568	494	30	259	19,227	1618	288	763	1662	2402	13	526	2005	–	–	–	–	66½	–	22,369
Oct.	I. Net and line boats,	42	–	–	–	845	178	21	13	1629	150	–	133	–	16	38	791	509	–	–	–	–	66	–	3082
	II. Steam beam trawlers,	–	–	–	–	2016	130	–	118	13,358	292	328	4	1510	1789	4	263	2953	–	–	–	–	–	–	17,611
	Total,	42	–	–	–	2861	308	21	131	14,987	442	328	137	1510	1805	42	1054	3462	–	–	–		66	–	20,693

TABLE E.—SHOWING FISH LANDED BY NET AND LINE BOATS AND BY STEAM BEAM TRAWL BOATS—*continued.*

Date.	District.	Herring.	Sprat.	Sparling	Mackerel.	Cod.	Ling.	Torsk (Tusk).	Saithe (Coalfish).	Haddock.	Whiting.	Turbot.	Halibut.	Sole (Lemon Sole).	Flounder, Plaice, Brill.	Eel.	Skate.	Other kinds of White Fish.	Oysters.	Mussels.	Clams.	Lobsters.	Crabs.	Other kinds of Shell Fish.	Total Value.
		cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	100s	cwt.	cwt.	100s	100s.	cwt.	£
	Aberdeen District— *continued.*																								
1892 Nov.	I. Net and line boats, .	–	–	–	–	1403	259	4	20	1393	153	–	27	–	5	41	455	450	–	–	–	–	–	–	3227
	II. Steam beam trawlers,	–	–	–	–	2202	141	–	113	17,994	333	319	5	–	4025	5	289	3381	–	–	–	–	20	–	19,089
	Total, .	–	–	–	–	3605	400	4	133	19,387	486	319	32	–	4030	46	744	3831	–	–	–	–	20	–	22,316
Dec.	I. Net and line boats, .	417	–	–	–	2090	538	–	202	1879	40	–	6	–	–	46	393	476	–	–	–	–	–	–	4521
	II. Steam beam trawlers,	–	–	–	–	1763	190	–	26	13,440	265	229	7	1128	3072	2	311	3393	–	–	–	–	–	–	18,010
	Total, .	417	–	–	–	3853	728	–	228	15,319	305	229	13	1128	3072	48	704	3869	–	–	–	–	–	–	22,531
Whole year.	I. Net and line boats, .	375,625	–	–	–	38,603	9749	362	5369	37,039	7115	30	11483	1	214	149	6613	3434	–	–	–	$8\frac{7}{10}$	$352\frac{1}{2}$	–	114,275
	II. Steam beam trawlers,	–	–	–	–	20,729	3023	–	1351	141,341	2281	2480	66	17,124	30,115	34	1923	24,854	–	–	–	–	6	–	178,618
	Total, .	375,625	–	–	–	56,382	11772	362	6720	178,380	9396	2510	11549	17,125	30,329	183	8536	28,288	–	–	–	$8\frac{7}{10}$	$358\frac{1}{2}$	–	292,893

TABLE F.—SHOWING THE QUANTITIES MONTHLY OF LARGE AND SMALL FISH LANDED IN THE LEITH AND ABERDEEN DISTRICTS BY BEAM TRAWLERS AND LINE FISHERMEN IN 1892.

Month.	Stations.	Cod (Large).	Cod (Small).	Haddock (Large).	Whiting (Large).	Haddock and Whiting (Small).	Turbot (Large).	Turbot (Small).	Halibut (Large).	Halibut (Small).	Lemon Sole, Flounder, Plaice, Brill (Large).	Lemon Sole, Flounder, Plaice, Brill (Small).	Other kinds of White Fish (Large).	Other kinds of White Fish (Small).
	LEITH.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Jan.	I. Beam trawl, . . .	2029	105	3471	427	527	142	9	...	...	326	36	677	562
	II. Line, extra-territorial, .	292	33	768	45	108	8	1	...	...	...	...	271	85
	III. Line, territorial, . .	2322	294	3994	119	476	...	...	...	...	102	23	243	157
Feb.	I. Beam trawl, . . .	1195	131	2158	479	304	27	3	...	...	188	20	355	296
	II. Line, extra-territorial, .	105	10	2495	138	311	3	...	3	...	...	...	248	92
	III. Line, territorial, . .	2269	268	1792	169	245	...	...	...	...	118	30	230	133
Mar.	I. Beam trawl, . . .	1640	172	3950	385	561	43	4	2	...	315	34	455	338
	II. Line, extra-territorial, .	1512	169	2932	182	385	6	1	6	...	131	14	368	172
	III. Line, territorial, . .	1359	199	883	95	132	...	...	...	...	227	30	121	119
Apr.	I. Beam trawl, . . .	3360	367	2767	385	432	110	9	2	...	706	77	995	664
	II. Line, extra-territorial, .	3697	407	2248	209	311	11	1	24	2	29	...	1441	772
	III. Line, territorial, . .	551	115	385	77	76	...	...	...	...	252	93	114	72
May	I. Beam trawl, . . .	1190	131	3476	274	477	53	4	1	...	709	87	1049	672
	II. Line, extra-territorial, .	5063	563	721	96	112	4	1	281	30	57	12	2825	958
	III. Line, territorial, . .	285	46	650	97	101	...	...	...	...	301	66	113	111
June	I. Beam Trawl, . . .	726	101	2259	192	193	49	6	1	...	996	115	864	432
	II. Line, extra-territorial, .	5403	657	216	63	26	12	2	207	7	...	...	3307	640
	III. Line, territorial, . .	104	41	537	104	240	...	...	...	...	251	88	44	36
July	I. Beam trawl, . . .	1063	118	5582	257	1945	116	10	...	...	880	97	863	612
	II. Line, extra-territorial, .	290	33	301	32	118	3	...	2	...	54	9	299	180
	III. Line, territorial, . .	104	18	565	124	219	2¼	...	...	...	190	29	79	69

TABLE F.—SHOWING THE QUANTITIES MONTHLY OF LARGE AND SMALL FISH LANDED IN THE LEITH AND ABERDEEN DISTRICTS BY BEAM TRAWLERS AND LINE FISHERMEN IN 1892—*continued.*

Month.	Stations.	Cod (Large).	Cod (Small).	Haddock (Large).	Whiting (Large).	Haddock and Whiting (Small).	Turbot (Large).	Turbot (Small).	Halibut (Large).	Halibut (Small).	Lemon Sole, Flounder, Plaice, Brill (Large).	Lemon Sole, Flounder, Plaice, Brill (Small).	Other kinds of White Fish (Large).	Other kinds of White Fish (Small).
	LEITH—*continued.*	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Aug.	I. Beam trawl,	703	78	6603	219	805	59	4	...	...	867	95	593	449
	II. Line, extra-territorial,	40	12	...	...	2	2	...	1	...	...	...	...	...
	III. Line, territorial,	197	53	519	162	311	2	...	1	...	192	74	98	63
Sept.	I. Beam trawl,	787	156	5505	526	1506	51	7	2	...	1280	255	1443	478
	II. Line, extra-territorial,	61	14	227	28	88	1	...	4	1	103	6	76	16
	III. Line, territorial,	40	34	417	62	242	...	...	...	...	192	143	25	15½
Oct.	I. Beam trawl,	511	127	5690	311	735	51	4	2	...	1140	125	1628	949
	II. Line, extra-territorial,	92	10	2746	209	397	1	...	...	...	314	36	372	253
	III. Line, territorial,	217	41	323	53	60	...	...	...	...	207	70	63	59
Nov.	I. Beam trawl,	1032	114	4747	140	572	40	4	...	...	754	82	844	531
	II. Line, extra-territorial,	398	43	1682	44	198	2	...	...	...	50	8	280	89
	III. Line, territorial,	623	78	541	41	73	...	...	...	...	169	69	82	56
Dec.	I. Beam trawl,	1157	130	2954	52	337	41	4	...	...	484	53	537	369
	II. Line, extra-territorial,	67	8	1463	28	186	10	1	2	...	4	1	210	12
	III. Line, territorial,	1378	179	765	38	93	...	...	...	...	76	36	1018	969
Total for Year.	Beam trawl,	15,393	1730	49,162	3647	8394	782	68	10	...	8645	1076	10,303	6352
	Line, extra-territorial,	17,020	1959	15,799	1074	2242	63	7	530	40	742	86	9697	3269
	Line, territorial,	9447	1366	11,371	1141	2268	4¼	...	1	...	2277	751	2230	1859½

TABLE F.—SHOWING THE QUANTITIES MONTHLY OF LARGE AND SMALL FISH LANDED IN THE LEITH AND ABERDEEN DISTRICTS BY BEAM TRAWLERS AND LINE FISHERMEN IN 1892—*continued.*

Month.	Stations.	Cod (Large).	Cod (Small).	Haddock (Large).	Whiting (Large).	Haddock and Whiting (Small).	Turbot (Large).	Turbot (Small).	Halibut (Large).	Halibut (Small).	Lemon Sole, Flounder, Plaice, Brill (Large).	Lemon Sole, Flounder, Plaice, Brill (Small).	Other kinds of White Fish (Large).	Other kinds of White Fish (Small).
	ABERDEEN.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Jan.	I. Beam trawl, ...	1148	597	7422	66	408	...	...	...	...	2950	53	...	...
	II. Line, ...	1907	558	2809	37	162	...	...	...	...	...	...	...	...
Feb.	I. Beam trawl, ...	2356	558	10,262	45	272	...	...	...	...	5854	62	...	...
	II. Line, ...	1884	355	6155	97	264	...	...	...	...	...	2	...	...
Mar.	I. Beam trawl, ...	2988	328	19,280	181	213	...	...	...	...	3304	187	...	...
	II. Line, ...	2164	275	3641	88	1094	...	...	...	...	1	34	...	...
April	I. Beam trawl, ...	2279	578	9225	124	454	...	...	...	...	3193	224	...	...
	II. Line, ...	6047	229	2678	248	1761	...	...	...	...	...	14	...	...
May	I. Beam trawl, ...	1096	665	5997	83	334	...	...	...	...	3539	107	...	...
	II. Line, ...	9941	311	2733	320	1799	...	...	...	...	...	...	...	...
June	I. Beam trawl, ...	881	781	3631	62	702	...	...	...	...	3475	96	...	...
	II. Line, ...	9532	149	3190	547	1651	...	...	...	...	...	13	...	...
July	I. Beam trawl, ...	1506	927	6491	180	309	...	...	...	...	3768	140	...	...
	II. Line, ...	...	...	1066	1243	669	...	...	...	...	...	11	...	...
Aug.	I. Beam trawl, ...	1259	1029	13,027	193	221	...	...	...	...	5036	184	...	...
	II. Line, ...	875	23	478	1317	775	...	...	...	...	...	13	...	...

TABLE F.—SHOWING THE QUANTITIES MONTHLY OF LARGE AND SMALL FISH LANDED IN THE LEITH AND ABERDEEN DISTRICTS BY BEAM TRAWLERS AND LINE FISHERMEN IN 1892—*continued.*

Month.	Stations.	Cod (Large).	Cod (Small).	Haddock (Large).	Whiting (Large).	Haddock and Whiting (Small).	Turbot (Large).	Turbot (Small).	Halibut (Large).	Halibut (Small).	Lemon Sole, Flounder, Plaice, Brill (Large).	Lemon Sole, Flounder, Plaice, Brill (Small).	Other kinds of White Fish (Large).	Other kinds of White Fish (Small).
	ABERDEEN—*continued.*	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Sept.	I. Beam trawl, . . .	1285	940	15,967	311	480	...	...	...	...	3821	137	...	...
	II. Line, ...	283	28	718	834	2535	...	...	...	...	...	106	...	...
Oct.	I. Beam trawl, . . .	2016	1809	12,973	291	386	...	...	...	...	3116	183	...	...
	II. Line, ...	845	298	851	90	838	...	...	...	...	...	16	...	...
Nov.	I. Beam trawl, . . .	2202	2057	17,698	333	296	...	...	...	...	5067	189	...	...
	II. Line, ...	1403	397	889	101	556	...	...	...	...	...	5	...	...
Dec.	I. Beam trawl, . . .	1763	2192	13,049	265	391	...	...	...	...	4103	97	...	...
	II. Line, ...	2090	476	1269	23	627	...	...	...	...	...	...	...	...
Tl. for Year.	. . { Beam, . .	20,779	12,461	135,022	2134	4466	...	...	...	...	46,766	1659	...	...
	{ Line, . .	36,971	3099	26,477	4945	12,731	...	...	...	...	1	214	...	...

TABLE G.—SHOWING THE MONTHLY TAKES OF LINE AND NET BOATS FROM INSHORE GROUNDS IN THE LEITH, ANSTRUTHER, MONTROSE, AND STONEHAVEN DISTRICTS.

I. LEITH DISTRICT. NORTH BERWICK.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (17)	106	1·53	61	0·88	31	0·44	7½	0·108	...	...	...	...	6	0·086	...	...	...	...	...	...	69	21 to 33 ft.	...	...
Feb. (17)	30½	0·55	20½	0·37	56	1·01	2½	0·045	...	...	...	...	3	0·05	...	...	...	...	...	...	55	20 to 23 ft.	...	...
Mar. (16)	1½	0·025	37	0·61	60½	1·006	14	0·23	...	...	...	...	4	0·06	...	...	...	...	...	...	60	19 to 23 ft.	...	...
Apr. (22)	...	...	35½	0·37	28	0·29	12½	0·13	...	...	...	...	23	0·24	...	...	7½	0·07	...	...	94	19 to 23 ft.	...	...
May (23)	...	...	55	0·23	255	1·08	42½	0·18	...	...	...	...	30	0·12	...	...	19	0·08	...	...	235	19 to 23 ft.	...	...
June (26)	...	...	34½	0·206	249½	1·49	43½	0·26	...	...	...	...	36½	0·21	...	...	15	0·08	...	...	167	...	...	...
July (24)	1	0·004	43	0·18	241½	1·05	45½	0·19	...	...	2½	0·01	25	0·109	...	...	8½	0·037	...	...	229	19 to 23 ft.	...	...
Aug. (23)	...	...	38	0·24	108	0·70	45½	0·29	...	...	...	...	18	0·11	...	...	6½	0·04	...	...	154	19 to 23 ft.	...	...
Sept. (20)	...	...	24½	0·19	77½	0·036	25	0·20	...	...	...	...	16½	0·13	...	...	5½	0·04	...	...	123	19 to 23 ft.	...	...
Oct. (10)	...	...	...	...	7	0·36	2½	0·13	...	...	...	...	2	0·105	...	...	...	...	...	...	19	19 to 23 ft.	...	...
Nov. (22)	...	...	7½	0·13	23	0·40	3	0·05	...	...	...	...	5	0·08	...	...	...	...	...	...	57	20 to 23 ft.	...	...
Dec. (22)	65½	0·75	21	0·24	12	0·13	...	...	...	...	...	...	4	0·04	...	...	...	...	...	...	87	...	...	...
Total for year	204½	0·15	382½	0·28	1149	0·85	244	0·18	...	...	2½	0·001	173	0·12	...	...	62	0·04	...	...	1349			

TABLE G.—I. LEITH DISTRICT—*continued*. COCKENZIE AND PORTSETON.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (22)	15	0·024	625	1·01	2772½	4·49	81	0·13	...	...	...	...	39	0·06	...	...	...	...	...	...	617	81 to 144 ft.	...	...
Feb. (23)	...	...	570	1·25	335	0·73	60	0·13	...	...	...	...	15	0·032	...	...	...	...	...	...	455	81 to 180 ft.	...	...
	...	...	708	1·31	176	0·32	21	0·038	...	...	...	...	5	0·009	...	...	...	...	...	...	540	81 to 141 ft.	...	...
Apr. (26)	...	...	250	0·56	88	0·201	24	0·054	...	...	...	...	18	0·04	...	...	...	...	...	...	436	81 to 141 ft.	...	...
May (23)	...	...	35	0·24	125	0·87	20	0·14	...	...	...	...	57	0·35	...	...	...	...	...	...	143	81 to 189 ft.	...	...
June (26)	...	...	18	0·12	129	0·92	24	0·17	...	...	...	...	60	0·44	...	...	...	...	...	...	140	... ...	...	...
July (23)	...	...	7	0·060	97	0·84	15½	0·13	...	...	...	...	36	0·22	...	...	...	...	...	...	115	81 to 183 ft.	...	...
Aug. (26)	...	...	4	0·03	87½	0·69	2½	0·019	...	...	...	...	54½	0·41	...	...	...	...	...	...	126	81 to 146 ft.	...	...
Sept. (26)	...	...	32½	0·18	74	0·41	12	0·066	...	...	...	...	74	0·41	...	...	...	...	...	...	180	81 to 141 ft.	...	...
Oct. (21)	...	...	105	0·502	102	0·48	19	0·090	...	...	...	...	41	0·19	...	...	...	...	...	...	209	81 to 141 ft.	...	...
Nov. (25)	...	...	374½	1·08	158	0·45	9	0·026	...	...	...	...	55	0·15	...	...	...	...	...	...	345	81 to 141 ft.	...	...
Dec. (26)	...	...	256	0·59	401	0·93	...	...	...	...	...	...	34½	0·08	...	...	...	...	...	...	428	81 to 199 ft.	...	...
Total for year	15	0·004	2985	0·79	4545	1·21	288	0·07	...	...	...	...	483	0·12	...	...	...	...	...	...	3734			

TABLE G.—I. LEITH DISTRICT—*continued.* FISHERROW.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (24)	922	7·37	639	5·11	219	1·75	25	1·20	...		...		10	0·08	...		59	0·47	57	0·45	125	22 to 28 ft.	14	44 to 58 ft.
Feb. (23)	413	3·59	513	4·46	602	5·23	48	0·41	...		...		65	0·56	...		12	0·14	60	0·52	115	22 to 33 ft.	8	35 to 60 ft.
Mar. (23)	...		237	2·11	147	1·31	32	0·28	...		...		133	1·18	...		...		49	0·43	112	22 to 29 ft.	86	44 to 58 ft.
Apr. (20)	...		101	1·31	65	0·84	15	0·19	...		...		83	1·07	...		...		35	0·45	77	24 to 35 ft.	50	44 to 58 ft.
May (20)	...		63	0·98	80	1·25	21	0·32	...		...		52	0·81	...		...		9	0·14	64	22 to 29 ft.	32	44 to 58 ft.
June (17)	...		35	0·62	40	0·71	12	0·21	...		...		53	0·94	...		...		7	0·125	56	25 to 29 ft.	11	42 to 58 ft.
July (15)	...		20	0·38	51	0·98	11	0·21	...		...		87	1·67	...		...		5	0·09	52	22 to 29 ft.	2	44 to 58 ft.
Aug. (13)	...		20	0·34	47	0·81	12	0·206	...		...		75	1·29	..		...		4	0·06	58	22 to 28 ft.	...	...
Sept. (16)	...		2	0·051	4	0·102	1	0·025	...		...		100	2·56	...		...		1	0·025	39	22 to 29 ft.	21	44 to 58 ft.
Oct. (21)	...		27	0·48	18	0·29	5	0·08	...		...		127	2·04	...		...		2	0·03	62	22 to 28 ft.	54	48 to 59 ft.
Nov. (18)	2	0·039	44	0·86	24	0·47	...	...	...		...		57	1·11	...		...		...		51	22 to 30 ft.	69	46 to 58 ft.
Dec. (23)	474	3·85	759	6·17	91	0·73	2	0·016	...		...		5	0·04	...		55	0·44	16	0·13	123	23 to 31 ft.	57	44 to 58 ft.
Total for year	1811	1·93	2460	2·63	1388	1·48	184	0·19	...		...		847	0·906	...		126	0·13	245	0·26	934			

TABLE.—I. LEITH DISTRICT—*continued.* NEWHAVEN.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (20)	...	...	1275	8·5	130	0·86	...	...	...	...	...	...	...	...	...	...	63	0·42	61	0·406	150	26 to 55 ft.	...	...
Feb. (18)	2732	22·57	1165	9·62	329	2·71	...	...	...	...	...	...	...	...	...	...	52	0·42	81	0·66	121	26 to 50 ft.	34	45 to 60 ft.
Mar. (23)	...	...	207	1·80	76	0·66	...	...	...	...	...	...	71½	0·62	...	...	...	...	3	0·026	115	15 to 28 ft.	149	40 to 50 ft.
Apr. (22)	...	...	77	0·706	55	0·504	...	...	...	...	...	...	78	0·71	...	...	...	...	10	0·091	109	16 to 26 ft.	145	48 to 50 ft.
May (21)	...	...	28	0·35	49	0·61	...	...	...	...	...	...	69	0·86	...	...	8	0·10	2	0·025	80	16 to 25 ft.	142	48 to 50 ft.
June (22)	...	...	24	0·21	38	0·33	...	...	...	...	...	...	104	0·91	...	...	22	0·19	4	0·035	114	16 to 25 ft.	178	48 to 50 ft.
July (21)	...	...	5½	0·091	36	0·58	...	...	...	...	...	...	50	0·81	...	...	6	0·098	...	...	61	16 to 25 ft.	15	48 to 60 ft.
Aug. (17)	...	...	10½	0·22	20½	0·43	...	...	...	...	...	...	52	1·106	...	...	...	...	...	...	47	16 to 25 ft.	1	48 ft.
Sept. (15)	...	...	...	...	...	...	...	...	...	...	...	...	32	1·103	...	...	...	...	...	...	29	16 ft.	27	48 to 50 ft.
Oct. (10)	...	...	...	...	...	...	...	...	...	...	...	...	5½	0·68	...	...	...	...	...	...	8	16 ft.	54	48 to 60 ft.
Nov. (17)	260	52·00	10	2·00	10	2·00	...	...	...	...	...	...	...	...	...	...	5	1·00	...	...	5	26 to 50 ft.	57	48 to 50 ft.
Dec. (22)	5366	42·25	856	6·74	1	0·007	...	...	...	...	...	...	...	...	...	...	139	1·09	78	0·61	127	26 to 50 ft.	15	48 to 50 ft.
Total for year	8358	8·63	3658	3·78	744½	0·77	...	...	...	...	...	...	462	0·47	...	...	295	0·305	239	0·24	966			

TABLE G.—H. ANSTRUTHER DISTRICT. LARGO.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Crans.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (24)	69½	0·404	140	0·81	108	0·62	...	...	...	...	...	...	...	...	...	...	...	...	...	...	172	15 to 24 ft.	...	...
Feb. (24)	23¼	0·09	130	0·52	102	0·41	...	...	...	...	...	...	248	1·00	10	0·04	...	...	...	...	248	15 to 24 ft.	...	...
Mar. (26)	...	...	73	0·27	71	0·27	...	...	...	...	...	...	114	0·43	8	0·03	...	...	...	...	262	15 to 25 ft.	...	...
Apr. (26)	...	...	46	0·37	83	0·68	...	...	...	...	...	...	6	0·04	...	...	...	...	...	...	122	18 to 24 ft.	...	...
May (24)	...	...	39	0·32	101	0·84	...	...	...	...	...	...	2	0·01	...	...	...	...	...	...	120	18 to 24 ft.	...	...
June (25)	...	...	25	0·20	100	0·80	...	...	...	...	...	...	...	...	...	...	...	...	...	...	125	18 to 24 ft.	...	...
July (24)	...	...	4	0·06	57	0·95	...	...	...	...	...	...	...	...	...	...	...	...	...	...	60	16 to 24 ft.	...	...
Aug. (24)	...	...	7	0·14	48	1·00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	48	15 to 20 ft.	...	...
Sept. (25)	...	...	19	0·106	90	0·50	...	...	...	...	...	...	47	0·27	28	0·15	...	...	...	...	179	15 to 25 ft.	...	...
Oct. (24)	...	...	99	0·39	36	0·14	...	...	...	...	...	...	135	0·54	7	0·02	...	...	...	...	249	15 to 25 ft.	...	...
Nov. (23)	...	...	84	0·51	55	0·33	...	...	...	...	...	...	20	0·12	...	...	...	...	...	...	164	15 to 24 ft.	...	...
Dec. (26)	...	...	164	0·84	79	0·407	...	...	...	...	...	...	...	...	...	...	...	...	...	...	194	15 to 24 ft.	...	...
Total for year	92¾	0·04	830	0·42	930	0·47	...	...	...	...	...	...	572	0·29	53	0·02	...	...	...	...	1943			

TABLE G.—II. Anstruther District—*continued*. Elie and Earlsferry.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
	Crans.	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
1892. Jan. (20)	12	0·15	33¼	0·43	89½	1·17	1¼	0·01	...	...	...	...	...	...	...	...	...	...	...	...	76	14 to 16 ft.	...	...
Feb. (23)	...	...	13	0·15	132	1·06	...	...	...	...	...	...	12	0·14	...	...	...	...	...	...	82	14 tc 16 ft.	...	...
Mar. (25)	...	...	22½	0·27	74	0·74	...	...	...	...	...	...	7½	0·07	...	...	...	...	...	...	99	16 ft.	...	...
Apr. (25)	...	...	9	0·07	73¼	0·06	...	...	...	...	...	...	1¼	0·01	...	...	...	...	...	...	122	16 to 17 ft.	...	...
May (24)	...	...	8¼	0·068	70½	0·58	...	...	...	...	...	...	...	...	...	...	...	...	40	0·33	120	14 to 16 ft.	...	...
June (25)	...	...	8	0·06	62½	0·05	...	...	...	...	...	...	7½	0·06	...	...	...	...	54¼	0·43	125	14 to 16 ft.	...	...
July (22)	...	...	7	0·07	63¼	0·66	8	0·03	...	...	...	...	...	...	...	...	...	...	2	0·02	95	14 to 16 ft.	...	...
Aug. (27)	...	...	8	0·07	63	0·60	21	0·20	...	...	...	...	...	...	...	...	...	...	...	...	105	14 to 16 ft.	...	...
Sept. (20)	...	...	7½	0·09	22	0·28	11½	0·15	...	...	...	...	...	...	...	...	...	...	...	...	76	14 to 16 ft.	...	...
Oct. (22)	...	...	9¾	0·102	11½	0·13	3½	0·04	...	...	...	...	...	...	...	...	...	...	...	...	85	14 to 16 ft.	...	...
Nov. (18)	...	...	8½	0·17	8¼	0·16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	49	14 to 16 ft.	...	...
Dec. (22)	½	0·007	17¾	0·27	21	0·32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	64	16 to 50 ft.	...	...
Total for year	12½	0·01	152½	0·13	690¾	0·62	45¼	0·04	...	...	...	...	28¼	0·02	...	...	...	...	96¼	0·08	1098			

TABLE G.—II. ANSTRUTHER DISTRICT—*continued.* ST. MONANCE.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Crans.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (25)	24	0·04	793	1·53	874	1·69	79	0·15	...	...	...	...	...	...	...	...	2	0·003	23	0·04	515	24 to 58 ft.	...	...
Feb. (24)	206	0·36	1328	2·35	597	1·05	77	0·13	...	...	...	...	...	...	...	...	...	...	...	...	565	24 to 58 ft.	12	48 to 54 ft.
Mar. (27)	166½	0·27	628	1·11	448	0·79	61	0·108	...	...	...	...	...	...	...	...	...	...	...	...	562	24 to 58 ft.	36	45 to 58 ft.
Apr. (25)	17	0·04	174	0·50	290	0·83	2	0·005	...	...	...	...	...	...	...	...	...	...	...	...	348	24 to 58 ft.	36	40 to 58 ft.
May (26)	...	...	22	0·07	319	1·15	64	0·23	...	...	...	...	...	...	...	...	...	...	...	...	276	24 to 30 ft.	53	45 to 58 ft.
June (26)	...	...	20	0·08	240	0·95	82	0·33	...	...	...	...	...	...	...	...	...	...	...	...	248	24 to 30 ft.	38	43 to 58 ft.
July (24)	...	...	47	0·34	124	0·91	42	0·31	...	...	...	...	...	...	...	...	...	...	...	...	135	24 to 28 ft.	...	...
Aug. (24)	21¼	0·14	40	0·26	117	0·77	44	0·29	...	...	...	...	...	...	...	...	...	...	...	...	151	18 to 55 ft.	4	45 to 56 ft.
Sept. (21)	...	...	39	0·33	135	1·14	33	0·27	...	...	...	...	...	...	...	...	...	...	...	...	118	24 to 30 ft.	...	...
Oct. (23)	...	...	109	0·37	397	1·38	26	0·09	...	...	...	...	...	...	...	...	...	...	...	...	287	24 to 30 ft.	...	...
Nov. (25)	...	...	103	0·33	396	1·306	26	0·08	...	...	...	...	...	...	...	...	...	...	...	...	303	24 to 54 ft.	6	45 ft.
Dec. (27)	108	0·19	503	0·89	744	1·32	60	0·106	...	...	...	...	...	...	...	...	34	0·06	15	0·02	563	24 to 56 ft.	...	...
Total for year.	542¾	0·13	3806	0·93	4681	1·14	596	0·14	...	...	...	...	...	...	...	...	36	0·008	38	0·009	4071			

TABLE G.—II. ANSTRUTHER DISTRICT—*continued*. PITTENWEEM.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
	Crans.	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
1892. Jan. (21)	24	0·19	77	0·63	271	2·23	10	0·08	...	...	...	...	...	...	...	...	...	...	...	...	121	25 ft.	79	48 to 53 ft.
Feb. (22)	126	0·906	61	0·43	243	1·74	3	0·02	...	...	...	...	...	...	...	...	...	...	...	...	139	25 ft.	127	48 to 53 ft.
Mar. (24)	8	0·05	38	0·27	208	1·49	3	0·02	...	...	...	...	...	...	...	...	...	...	...	...	139	25 ft.	159	48 to 53 ft.
Apr. (24)	11	0·08	40	0·305	91	0·69	2	0·015	...	...	...	...	...	...	...	...	...	...	...	...	131	25 ft.	22	48 to 52 ft.
May (21)	...	...	39	0·27	205	1·44	11	0·07	...	...	...	...	...	...	...	...	...	...	...	...	142	25 ft.	8	48 to 52 ft.
June (24)	...	...	34	0·19	204	1·19	27	0·15	...	...	...	...	...	...	...	...	...	...	...	...	171	25 ft.	3	48 to 52 ft.
July (23)	7	0·04	36	0·23	227	1·49	25	0·16	...	...	...	...	...	...	...	...	...	...	...	...	152	25 ft.	...	...
Aug. (19)	13	0·11	27	0·23	177	1·51	14	0·11	...	...	...	...	...	...	...	...	...	...	...	...	117	25 ft.	4	48 ft.
Sept. (19)	...	...	22	0·201	135	1·23	11	0·10	...	...	...	...	...	...	...	...	...	...	...	...	109	25 ft.	...	...
Oct. (20)	...	...	29	0·22	107	0·81	6	0·04	...	...	...	...	...	...	...	...	...	...	...	...	131	25 ft.	10	48 to 52 ft.
Nov. (20)	...	...	29	0·22	112	0·86	8	0·06	...	...	...	...	...	...	...	...	...	...	...	...	129	25 ft.	127	48 to 52 ft.
Dec. (25)	4	0·02	63	0·33	250	1·32	13	0·06	...	...	...	...	...	...	...	...	...	...	...	..	189	25 ft.	228	50 ft.
Total for year	193	0·11	495	0·29	2230	1·33	133	0·07	...	...	...	...	...	...	...	...	...	...	...	...	1670			

TABLE G.—II. ANSTRUTHER DISTRICT—*continued*. ANSTRUTHER.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Crans.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (24	295½	1·23	75	0·31	45	0·18	2	0·008	...	...	...	...	...	...	...	...	...	...	5	0·02	240	28 to 58 ft.	164	50 to 58 ft.
Feb. (25)	2247	3·16	410	0·57	49	0·06	...	...	...	...	...	...	...	...	...	...	...	...	6	0·008	709	25 to 58 ft.	247	46 to 58 ft.
Mar. (27)	1758	3·01	215	0·36	18½	0·03	...	...	...	...	...	...	...	...	...	...	...	...	...	...	584	25 to 58 ft.	182	48 to 58 ft.
Apr. (20)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	122	46 to 58 ft.
May (13)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	176	47 to 58 ft.
June (14)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	175	46 to 57 ft.
July (12)	3½	0·23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15	28 to 40 ft.	53	42 to 50 ft.
Aug. (17)	328	2·71	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	121	24 to 54 ft.	69	40 to 53 ft.
Sept. (8)	...	...	3	0·42	8	1·14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	28 ft.	2	45 ft.
Oct. (17)	...	...	3¾	0·23	16¼	1·01	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16	28 ft.	22	46 to 88 ft.
Nov. (19)	...	...	5	0·16	34	1·13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	30	25 to 28 ft.	74	50 to 88 ft.
Dec. (26)	432	1·84	80	0·34	39	0·16	...	...	...	...	...	...	...	...	...	...	...	...	...	...	234	25 to 56 ft.	260	50 to 58 ft.
Total for year	5064	2·58	791¾	0·404	209¾	0·107	2	0·001	...	...	...	...	...	...	...	...	...	...	11	0·005	1956			

TABLE G.—II. ANSTRUTHER DISTRICT—*continued*. CRAIL.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Crans.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (14)	...	...	133	1·66	76	0·95	...	...	...	...	...	...	...	...	8½	0·106	...	...	...	...	80	18 to 32 ft.	...	...
Feb. (15)	18	0·18	69	0·72	40	0·41	...	...	...	...	...	...	...	...	1½	0·15	...	...	...	...	97	15 to 26 ft.	...	...
Mar. (20)	...	...	85½	0·55	3½	0·02	...	...	...	...	...	...	...	...	11½	0·07	...	...	...	...	155	14 to 28 ft.	...	...
Apr. (18)	...	...	124	0·35	...	...	...	...	...	...	...	...	...	...	8	0·02	...	...	...	...	354	14 to 28 ft.	...	...
May		Fishing	for crabs		only.		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	... ...	...	...
June (26)		,,	,,		,,		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15 to 25 ft.	...	...
July (26)	...	...	159½	0·44	67	0·18	...	...	...	...	...	...	...	...	9½	0·026	...	...	...	...	360	14 to 26 ft.	...	...
Aug. (27)	...	...	63	0·24	125½	0·48	...	...	...	...	...	...	...	...	12	0·04	...	...	26	0·101	257	15 to 26 ft.	...	...
Sept. (22)	...	...	57½	0·35	46½	0·28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	162	14 to 24 ft.	...	...
Oct. (22)	...	...	103	0·49	72	0·34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	208	17 to 26 ft.	...	...
Nov. (21)	...	...	52	0·25	81	0·40	...	...	...	...	...	...	...	...	10½	0·05	...	...	...	...	201	17 to 26 ft.	...	...
Dec. (22)	...	...	253½	0·96	124½	0·47	...	...	...	...	...	...	...	...	15	0·05	...	...	...	...	264	17 to 26 ft.	...	...
Total for year	18.	0·006	1100	0·40	636	0·23	...	...	...	...	...	...	...	...	76½	0·02	...	...	26	0·009	2138			

TABLE G.—II. ANSTRUTHER DISTRICT—*continued.* ST. ANDREWS.

Months and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Crans.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (13)	...	...	7	0·07	413	4·39	...	...	...	...	...	...	6	0·06	...	...	...	...	...	...	94	30 to 43 ft.	94	30 to 43 ft.
Feb. (15)	...	...	49	0·48	12	0·11	...	...	...	...	...	...	206	2·03	...	...	...	...	...	...	101	20 to 43 ft.	86	42 to 43 ft.
Mar. (21)	...	...	...	...	...	...	...	...	...	...	...	...	277	2·68	...	...	...	...	...	...	103	20 to 43 ft.	234	30 to 43 ft.
Apr. (22)	...	...	1	0·02	10	0·23	...	...	...	...	...	...	37	0·86	9	0·209	...	...	...	...	43	20 to 30 ft.	253	30 to 56 ft.
May (24)	...	...	...	...	10	0·11	...	...	...	...	...	...	44	0·51	107	1·25	...	...	...	...	85	20 to 30 ft.	257	30 to 56 ft.
June (25)	...	...	...	...	...	...	...	...	...	...	...	...	8½	0·08	183	1·88	...	...	...	...	97	20 to 30 ft.	228	42 to 56 ft.
July (22)	...	...	...	...	...	...	...	...	...	...	...	...	7	0·07	119	1·32	...	...	...	...	90	20 to 32 ft.	89	30 to 42 ft.
Aug. (23)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	91	1·31	...	...	...	...	69	20 to 42 ft.	53	30 to 42 ft.
Sept. (26)	...	...	...	...	...	...	...	...	...	...	...	...	58½	0·75	165	2·11	...	...	...	...	78	20 to 54 ft.	159	30 to 54 ft.
Oct. (17)	...	...	...	...	...	...	...	...	...	...	...	...	2	0·11	14	0·82	...	...	...	...	17	20 to 42 ft.	200	30 to 54 ft.
Nov. (25)	...	...	48	1·14	...	...	...	...	...	...	...	...	12	0·28	...	...	...	...	...	...	42	20 to 42 ft.	207	30 to 43 ft.
Dec. (22)	...	...	23	1·27	...	...	...	...	...	...	...	...	2	0·11	...	...	...	...	...	...	18	20 to 25 ft.	257	30 to 43 ft.
Total for year	...	...	128	0·15	445	0·21	...	...	...	...	...	...	660	0·78	688	0·82	...	...	...	...	837			

TABLE G.—III. MONTROSE DISTRICT. Broughty Ferry.

Months and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot. and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (5)	...	...	1	0·25	1¼	0·31	...	...	...	...	...	...	1½	0·37	¼	0·06	...	...	¼	0·06	4	20 ft.	72	30 to 50 ft.
Feb. (13)	...	...	3	0·04	2	0·02	...	...	...	...	...	...	159	2·304	...	...	...	...	½	0·007	69	18 to 30 ft.	119	34 to 55 ft.
Mar. (15)	...	...	...	...	...	...	...	...	...	...	...	...	345	2·55	...	...	...	...	...	...	135	18 to 24 ft.	209	30 to 55 ft.
Apr. (20)	...	...	1	0·007	...	...	...	...	...	...	...	...	278	2·17	...	...	...	...	1	0·007	128	18 to 24 ft.	161	30 to 55 ft.
May	No return.																							
June (20)	...	...	1	0·014	...	...	...	...	¼	0·003	...	...	91	1·31	65½	0·94	...	...	16¾	0·24	69	18 to 20 ft.	132	30 to 55 ft.
July (15)	...	...	...	...	...	...	...	...	...	...	...	...	23	0·95	28¼	1·17	...	...	...	...	24	18 to 20 ft.	28	30 to 50 ft.
Aug. (8)	...	...	...	...	...	...	...	...	...	...	...	...	5	0·45	7	0·63	...	...	...	...	11	18 to 30 ft.	7	30 to 42 ft.
Sept. (16)	...	...	...	...	...	...	...	...	...	...	...	...	38½	0·96	52½	1·31	...	...	...	...	40	18 to 20 ft.	180	30 to 55 ft.
Oct. (16)	...	...	2	0·05	18½	0·47	...	...	¼	0·006	...	...	25½	0·65	13¾	0·35	...	...	6¼	0·16	39	18 to 20 ft.	108	30 to 50 ft.
Nov. (17)	80	0·80	4	0·04	14½	0·14	2	0·02	...	...	...	...	12½	0·12	8	0·08	...	...	7½	0·07	99	15 to 20 ft.	144	30 to 55 ft.
Dec. (18)	24	0·33	6¼	0·08	39	0·54	...	...	...	...	...	...	5	0·07	5¼	0·07	...	...	8	0·11	71	18 to 20 ft.	180	30 to 35 ft.
Total for year	104	0·15	18¼	0·02	75¼	0·109	2	0·002	½	0·007	...	...	984	1·42	180¾	0·26	...	...	40¼	0·05	689			

TABLE G.—III. MONTROSE DISTRICT—*continued*. ARBROATH.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (18)	102	0·92	48	0·43	23	0·209	...	...	...	...	...	...	...	...	...	...	...	...	61	0·55	110	18 to 30 ft.	397	30 to 45 ft.
Feb. (21)	319	2·03	...	...	32	0·203	...	...	...	...	...	...	...	...	...	...	...	...	34	0·21	157	18 to 30 ft.	487	30 to 45 ft.
Mar. (18)	...	...	7	0·07	52	0·52	...	...	...	...	...	...	1	0·01	...	...	...	...	41	0·41	100	18 to 30 ft.	427	30 to 50 ft.
Apr. (24)	...	...	4	0·03	31	0·26	...	...	...	...	...	...	1½	0·013	3½	0·03	...	...	46	0·40	115	18 to 30 ft.	422	30 to 50 ft.
May (23)	...	...	...	...	49½	0·55	...	...	...	...	...	...	...	...	...	...	...	...	18½	0·207	89	18 to 30 ft.	375	30 to 50 ft.
June (25)	...	...	2	0·016	47½	0·39	...	...	...	...	...	...	...	...	...	...	...	...	52	0·42	121	18 to 30 ft.	295	30 to 50 ft.
July (23)	...	...	½	0·005	56½	0·601	...	...	...	...	...	...	...	...	...	...	...	...	24	0·25	94	18 to 30 ft.	109	30 to 50 ft.
Aug. (26)	...	...	2	0·02	38	0·52	...	...	...	...	...	...	...	...	...	...	...	...	12½	0·17	73	18 to 30 ft.	110	30 to 50 ft.
Sept. (21)	...	...	...	...	43	0·53	...	...	...	...	...	...	...	...	14½	0·17	...	...	16½	0·203	81	18 to 30 ft.	359	30 to 50 ft.
Oct. (18)	...	...	½	0·008	7	0·11	...	...	...	...	...	...	...	...	...	...	...	...	69½	1·17	59	18 to 30 ft.	463	30 to 50 ft.
Nov. (19)	...	...	½	0·007	7½	0·11	...	...	...	...	...	...	...	...	...	...	...	...	75	1·13	66	18 to 30 ft.	480	30 to 50 ft.
Dec. (24)	129	1·02	15½	0·12	26½	0·21	...	...	...	...	...	...	...	...	...	...	...	...	128	1·01	126	18 to 30 ft.	539	30 to 50 ft.
Total for year	550	0·46	80	0·06	413½	0·34	...	...	...	...	...	...	2½	0·002	18	0·01	...	...	578	0·48	1191			

TABLE G.—III. MONTROSE DISTRICT—*continued*. AUCHMITHIE.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot. and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (13)	...		7	0·104	61	0·91	9½	0·14	...	...	...	...	3	0·04	...	...	1	0·015	64	0·95	67	18 to 20 ft.	122	18 to 20 ft.
Feb. (15)	...		2	0·105	40	2·105	2½	0·13	...	...	...	...	1	0·05	...	...	½	0·02	13	0·68	19	18 to 20 ft.	180	18 to 20 ft.
Mar. (14)	...		3	0·06	46	0·95	4½	0·09	...	...	...	...	4	0·08	...	...	1½	0·03	39½	0·82	48	16 to 20 ft.	128	18 to 20 ft.
Apr. (19)	...		6	0·22	23	0·85	2	0·07	...	...	...	...	2¼	0·08	...	...	¾	0·02	8½	0·31	27	15 to 20 ft.	186	18 to 20 ft.
May (17)	...		6½	0·12	52	1·00	6½	0·12	...	...	...	...	3	0·05	...	...	...	...	14	0·26	52	16 to 20 ft.	167	18 to 20 ft.
June (18)	...		3	0·27	11	1·00	2¼	0·204	...	...	...	...	1½	0·13	...	...	...	...	4½	0·409	11	16 to 20 ft.	231	18 to 20 ft.
July (18)	...		7	0·26	38	1·46	7	0·26	...	...	...	...	2	0·07	...	...	1½	0·05	9	0·34	26	18 to 20 ft.	82	18 to 20 ft.
Aug. (13)	...		3	0·12	37	1·48	7	0·28	...	...	...	...	2¼	0·09	...	...	1	0·04	7	0·28	25	18 to 20 ft.	32	18 to 20 ft.
Sept. (18)	...		5½	0·13	65	1·62	7¾	0·19	...	...	...	...	3¼	0·08	...	...	1½	0·03	19	0·47	40	18 to 28 ft.	106	18 to 28 ft.
Oct. (14)	...		5¾	0·09	32	0·51	4½	0·07	...	...	...	...	3	0·04	...	...	...	...	73	1·17	62	18 to 28 ft.	105	18 to 28 ft.
Nov. (13)	...		5½	0·11	75	1·53	8	0·16	...	...	...	...	2½	0·05	...	...	1	0·02	21½	0·43	49	18 to 20 ft.	60	18 to 20 ft.
Dec. (22)	...		7	0·08	73	0·89	3¾	0·04	...	...	...	...	3	0·03	...	...	1	0·01	62	0·75	82	18 to 20 ft.	202	18 to 20 ft.
Total for year	...		61¼	0·12	553	1·08	65¼	0·12	...		...		30¾	0·06	...	...	9¾	0·01	335	0·65	508	...	...	...

TABLE G.—III. MONTROSE DISTRICT—*continued*. MONTROSE

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
	Cwts.	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
1892. Jan. (21)	...		43	0·07	566	1·02	...	...	...	...	...	...	49	0·08	15¼	0·02	...	...	72½	0·13	552	10 to 45 ft.	520	30 to 54 ft.
Feb. (25)	...		38	0·06	747	1·32	14½	0·02	...	...	...	...	59	0·10	16	0·02	...	...	44½	0·07	565	12 to 45 ft.	330	30 to 54 ft.
Mar. (27)	...		6½	0·02	17	0·05	...	...	...	...	...	...	69	0·23	23½	0·07	...	..	26	0·08	299	12 to 30 ft.	511	18 to 54 ft.
Apr. (22)	No boats		fishing within		territorial		waters.		...	...	...	...	...	...	...	...	...	...	...	...	...	... ...	335	18 to 54 ft.
May (20)	”		”		”		”		...	...	...	...	...	...	...	...	...	...	...	...	...	... ...	391	18 to 54 ft.
June (23)	...		5½	0·16	27	0·79	6	0·17	..	...	...	...	3½	1·02	4	0·11	1	0·02	7	0·205	34	16 to 25 ft.	556	18 to 54 ft.
July	No return.																							
Aug. (21)	...		19½	0·13	74	0·52	57	0·401	...	...	...	...	10½	0·07	25	0·17	...	...	21	0·14	142	15 to 30 ft.	161	18 to 40 ft.
Sept. (16)	...		11½	0·15	53	0·69	12	0·15	...	...	...	...	2	0·02	3½	0·04	...	...	13	0·17	76	18 to 40 ft.	90	30 to 54 ft.
Oct.	No return.																							
Nov. (13)	...		12	0·17	45	0·64	...	...	...	...	...	...	...	...	4½	0·06	...	...	10	0·14	70	18 to 40 ft.	274	30 to 54 ft.
Dec. (19)	...		17	0·15	67	0·609	...	...	...	...	...	...	...	...	...	...	...	...	17½	0·15	110	18 to 25 ft.	334	20 to 54 ft.
Total for year	...	...	153	0·08	1596	0·86	89½	0·04	...	...	...	...	193	0·104	91¾	0·04	...	...	211½	0·11	1848			

TABLE G.—III. MONTROSE DISTRICT—*continued*. JOHNSHAVEN.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (17)	...		14	0·202	147	2·13	...		...		..		...		...		...		67½	0·97	69	22 to 25 ft.	159	25 to 35 ft.
Feb. (20)	...		25½	0·28	180	2·00	1	0·01	...		...		1½	0·01	...		...		106½	1·18	90	22 to 25 ft.	229	25 to 35 ft.
Mar. (24)	...		27	0·34	65	0·83	...		...		...		13½	0·15	...		...		67	0·85	78	18 to 22 ft.	156	25 to 35 ft.
Apr. (21)	...		...		54	0·91	...		...		...		3½	0·05	...		...		15	0·25	59	18 to 22 ft.	102	35 to 50 ft.
May (21)	...		...		68½	1·14	4	0·06	...		...		...		...		...		...		60	15 to 22 ft.	85	25 to 50 ft.
June (18)	...		...		100	1·56	14	0·21	...		...		...		...		...		6½	0·101	64	18 to 22 ft.	57	35 to 50 ft.
July (22)	...		...		99	1·94	18	0·35	...		...		...		4¼	0·08	...		11½	0·22	51	18 to 22 ft.	23	25 to 35 ft.
Aug. (18)	...		...		27½	1·19	...		...		...		...		8½	0·36	...		6½	0·28	23	22 ft.	6	32 to 35 ft.
Sept. (20)	...		...		38¾	0·59	18½	0·28	...		...		...		10¾	0·16	...		5½	0·08	65	18 to 26 ft.	134	22 to 35 ft.
Oct. (12)	...		1	0·01	21½	0·41	...		...		...		...		...		...		54	1·03	52	18 to 25 ft.	137	25 to 35 ft.
Nov. (13)	...		2½	0·04	22	0·43	...		...		...		...		...		...		50	0·98	57	18 to 22 ft.	152	25 to 35 ft.
Dec. (24)	...		132½	1·07	74¼	0·603	...		...		...		2½	0·02	8½	0·06	...		111	0·97	123	18 to 35 ft.	206	25 to 35 ft.
Total for year	...		202½	0·25	897½	1·14	55½	0·07	...		...		21	0·02	32	0·04	...		501	0·63	785			

TABLE G.—III. MONTROSE DISTRICT—*continued.* GOURDON.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
	Cwts.	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
1892. Jan. (18)	35	1·206	1	0·03	20	0·68	...	...	...	...	...	...	...	...	...	...	...	...	24	0·82	29	24 to 32 ft.	432	24 to 39 ft.
Feb. (18)	80	1·42	10	0·17	28	0·50	...	...	...	...	...	...	...	...	...	...	...	...	46	0·82	56	27 to 34 ft.	680	24 to 39 ft.
Mar. (23)	...	...	...	...	25	0·73	...	...	...	...	...	...	...	...	...	...	...	...	43	1·26	34	24 to 32 ft.	579	24to 39 ft.
Apr. (25)	...	...	...	...	35	1·52	...	...	...	...	...	...	...	...	...	...	...	...	31	1·34	23	27 to 32 ft.	996	27 to 40 ft.
May (22)	...	...	...	...	22	0·709	6	0·19	...	...	...	...	...	...	...	...	...	...	24	0·77	31	30 to 34 ft.	707	30 to 48 ft.
June (26)	...	...	...	...	56	1·51	...	...	...	...	...	...	...	...	...	...	...	...	33	0·89	37	27 to 35 ft.	596	24 to 46 ft.
July (24)	...	...	...	...	41	1·51	15	0·55	...	...	...	...	...	...	...	...	...	...	14	0·51	27	29 to 34 ft.	210	30 to 39 ft.
Aug.																								
Sept. (21)	...	...	...	...	17	0·94	...	...	...	...	...	...	...	...	...	...	...	...	32	1·77	18	26 to 34 ft.	656	24 to 39 ft.
Oct. (15)	...	...	27	0·79	36	1·05	1	0·029	...	...	...	...	...	...	...	...	...	...	32	0·94	34	30 ft.	622	30 to 40 ft.
Nov. (16)	...	...	7	0·21	36	1·12	...	...	...	...	...	...	...	...	...	...	...	...	40	1·25	32	30 to 35 ft.	587	27 to 40 ft.
Dec. (26)	20	0·27	100	1·35	46	0·62	1	0·013	...	...	...	...	...	...	...	...	16	0·21	88	1·18	74	30 to 34 ft.	819	25 to 49 ft.
Total for year	135	0·34	145	0·36	362	0·91	23	0·05	...	..	...	...	...	...	...	...	16	0·04	407	1·03	395			

TABLE G.—IV. STONEHAVEN DISTRICT. Shieldhill to Skateraw.

Month and Number of Days Fishing.	Quantity of Net and Line Fish caught within the Territorial Waters.																				Number of Trips and Size of Boats Fishing.			
	Herring.		Cod.		Haddock.		Whiting.		Lemon Soles.		Turbot and Brill.		Plaice and Flounders.		Dabs.		Skate.		Other White Fish.		Within the Territorial Waters.		Beyond the Territorial Waters.	
1892.	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*Cwts.*	*Aver.*	*No.*	*Size.*	*No.*	*Size.*
Jan. (21)	314	0·42	568	0·77	1739	2·36	24	0·03	...	...	...	...	4	0·005	...	...	...	...	49	0·06	735	18 to 40 ft.	342	26 to 40 ft.
Feb. (21)	601	0·68	610	0·69	2223	1·52	50	0·05	...	...	2	0·002	6	0·006	...	...	...	...	57	0·06	881	18 to 40 ft.	194	...
Mar. (22)	...	...	388	0·86	517	1·15	12	0·02	...	...	...	...	17	0·03	...	...	...	...	...	...	449	18 to 34 ft.	621	26 to 40 ft.
Apr. (26)	...	...	503	0·73	390	0·57	12	0·01	...	...	...	...	17	0·02	...	...	...	...	...	...	684	18 to 26 ft.	316	18 to 58 ft.
May (24)	...	...	406	0·69	595	1·02	80	0·13	...	...	...	...	11	0·018	...	...	...	...	11	0·018	582	18 to 26 ft.	284	18 to 60 ft.
June (26)	10	0·018	415	0·77	305	0·57	54	0·1009	...	...	...	...	9	0·016	...	...	...	...	16	0·02	535	18 to 26 ft.	298	18 to 60 ft.
July (26)	34	0·06	62	0·11	493	0·94	330	0·62	...	...	...	...	4	0·007	...	...	4	0·007	46	0·08	524	16 to 24 ft.	756	18 to 58 ft.
Aug. (26)	21	0·04	163	0·31	329	0·62	344	0·65	...	...	...	...	28	0·05	...	...	...	...	52	0·09	524	18 to 22 ft.	515	38 to 50 ft.
Sept. (25)	...	...	180	0·48	402	1·07	102	0·27	...	...	...	...	18	0·048	...	...	...	...	22	0·058	373	18 to 24 ft.	773	26 to 38 ft.
Oct. (21)	...	...	231	0·92	209	0·83	4	0·015	...	...	...	...	15	0·05	...	...	...	...	2	0·007	251	18 to 36 ft.	717	22 to 38 ft.
Nov. (19)	...	...	148	0·79	119	0·63	...	...	...	...	...	...	6	0·032	...	...	2	0·01	6	0·03	187	18 to 38 ft.	791	18 to 38 ft.
Dec. (27)	1266	1·79	850	1·20	368	0·52	...	...	...	...	2	0·002	2	0·002	...	...	28	0·039	165	0·23	706	18 to 38 ft.	440	22 to 38 ft.
Total for year	2246	0·34	4524	0·70	7689	1·19	1012	0·15	...	...	4	0·0006	137	0·02	...	...	34	0·005	426	0·06	6431			

TABLE H.—Showing the Quantities of Fish (in Cwts.) captured by Line Fishermen in the Territorial Waters of certain districts, with the Average per 'shot' in 1890, 1891 and 1892.

Note.—The Decimal figures in the second columns give the average cwts. per "'shot."

DISTRICT.	Cod.		Haddock.		Whiting.		Lemon Soles, Flounders and Dabs.		Skate and Turbot.		Other White Fish.		Total Fish.		Total Trips.
								1890.							
Leith,	8,534	1·08	4,933¼	0·62	983	0·12	2,593¾	0·32	623¼	0·07	666	0·08	18,333¼	2·325	7,885
Anstruther,	9,572¾	0·80	9,427$\frac{7}{12}$	0·79	1,801	0·15	3,571⅚	0·30	10½	0·000	447¾	0·03	24,831½	2·097	11,841
Montrose,	1,267⅞	0·16	11,659¼	1·54	2,122	0·28	994¼	0·13	27	0·003	3,519½	0·46	19,589½	2·595	7,547
Stonehaven,	2,949	0·40	13,552	1·87	4,001	0·55	211	0·02	15½	0·002	209½	0·02	20,938	2·896	7,228
Total,	22,323⅝	0·64	39,572$\frac{1}{12}$	1·14	8,907	0·25	7,370⅚	0·21	676¼	0·01	4,842¾	0·11	83,692¼	2·425	34,501
								1891.							
Leith,	12,474½	1·63	5,017½	0·65	1,564¼	0·20	1,805	0·23	602	0·07	944	0·12	22,407	2·943	7,613
Anstruther,	10,129½	0·74	9,845	0·72	1,620¾	0·11	2,722	0·19	2½	0·00	430	0·03	24,749¾	1·810	13,670
Montrose,	2,206¼	0·24	12,321½	1·36	1,370½	0·15	2,535	0·28	24¾	0·00	4,119¾	0·46	22,577¾	2·521	8,954
Stonehaven,	3,990	0·51	14,807	1·92	3,537	0·54	156½	0·02	5	0·00	239	0·03	22,734½	2·956	7,691
Total,	28,800¼	0·75	41,991	1·13	8,092½	0·21	7,218½	0·19	634¼	0·01	5,732¾	0·15	92,469	2·438	37,928
								1892.							
Leith,	9,485½	1·35	7,826½	1·12	716	0·10	1,965	0·28	485½	0·06	484	0·06	20,962½	3·001	6,983
Anstruther,	7,303¼	0·53	9,822½	0·71	776¼	0·05	2,077¾	0·15	36	0·002	171¼	0·01	20,187	1·47	13,713
Montrose,	660	0·12	3,897¼	0·71	235¼	0·04	1,553¾	0·28	25¾	0·004	2,072¾	0·38	8,444¾	1·55	5,416
Stonehaven,	4,524	0·70	7,689	1·19	1,012	0·15	137	0·02	38	0·005	426	0·06	13,826	2·10	6,431
Total,	21,972¾	0·67	29,235¼	0·89	2,739½	0·08	5,733½	0·17	585¼	0·01	3,154	0·09	63,420¼	1·94	32,543

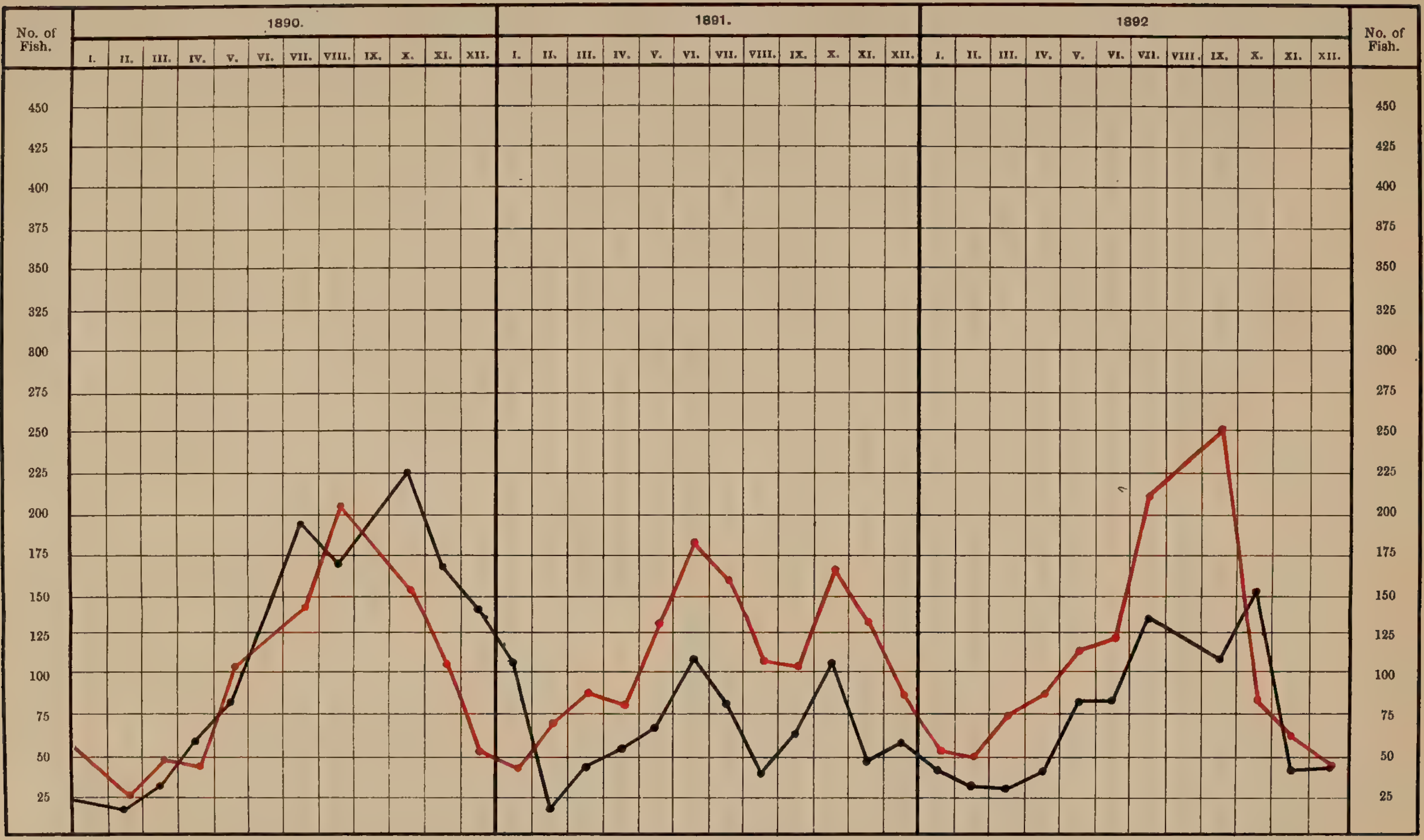
TABLE I.—Showing the Monthly Amounts in cwts. of Round and Flat Fish landed by Line Fishermen and Beam Trawlers on the East Coast of Scotland during 1892.

MONTH.	Northern Section (from Aberdeen northwards).				Southern Section (south of Aberdeen).				Whole East Coast.			
	Round Fish.		Flat Fish.		Round Fish.		Flat Fish.		Round Fish.		Flat Fish.	
	Line.	Beam Trawl.	Line.	Beam Trawl.	Line.	Beam Trawl.	Line.	Beam Trawl.	Line.	Beam Trawl.	Line.	Beam Trawl.
January, ...	46,560½	10,774	1,281	2,888	32,915	8,532	436	1,093	79,475½	19,306	1,717	3,981
February, ...	85,348	15,134	3,168½	6,295	38,094	5,622	1,162	671	123,442	20,756	4,330½	6,966
March, ...	83,553	26,119	6,374	3,857½	33,879	9,449	1,762½	1,004	117,432	35,568	8,136½	4,861½
April, ...	56,631	14,526	11,292	3,826	31,574	9,572	1,924½	1,610	88,205	24,098	13,216½	5,436
May, ...	49,286	9,433	7,114	3,936	45,964	7,717	2,989½	1,676	95,250	17,150	10,103½	5,612
June, ...	36,766	8,812	6,251½	3,745	48,070	5,345	3,948½	2,168½	84,836	14,157	10,200	5,913½
July, ...	13,387	10,732	2,948	4,146	9,495	11,465	658¾	1,712	22,882	22,197	3,606¾	5,858
August, ...	11,331	16,896	2,780	5,680	5,272½	12,810	508	1,547	16,603½	29,706	3,288	7,227
September, ...	30,075	20,308	2,047	4,404	11,455½	11,829	1,130	2,670½	41,530½	32,137	3,177	7,074½
October, ...	33,222	18,871	1,636½	3,894	19,992	10,225	1,280	2,945	53,214	29,096	2,916½	6,839
November, ...	39,754	24,184	1,615¾	5,874½	20,151	9,102	718½	1,470	59,905	33,286	2,334¼	7,344½
December, ...	42,249	19,097	1,267½	4,759	24,328	6,870	680½	1,088½	66,577	25,967	1,948	5,847½
Totals, ...	528,162½	194,886	47,775¾	53,305	321,190	108,538	17,098¾	19,655½	859,352½	303,424	64,874½	72,960½

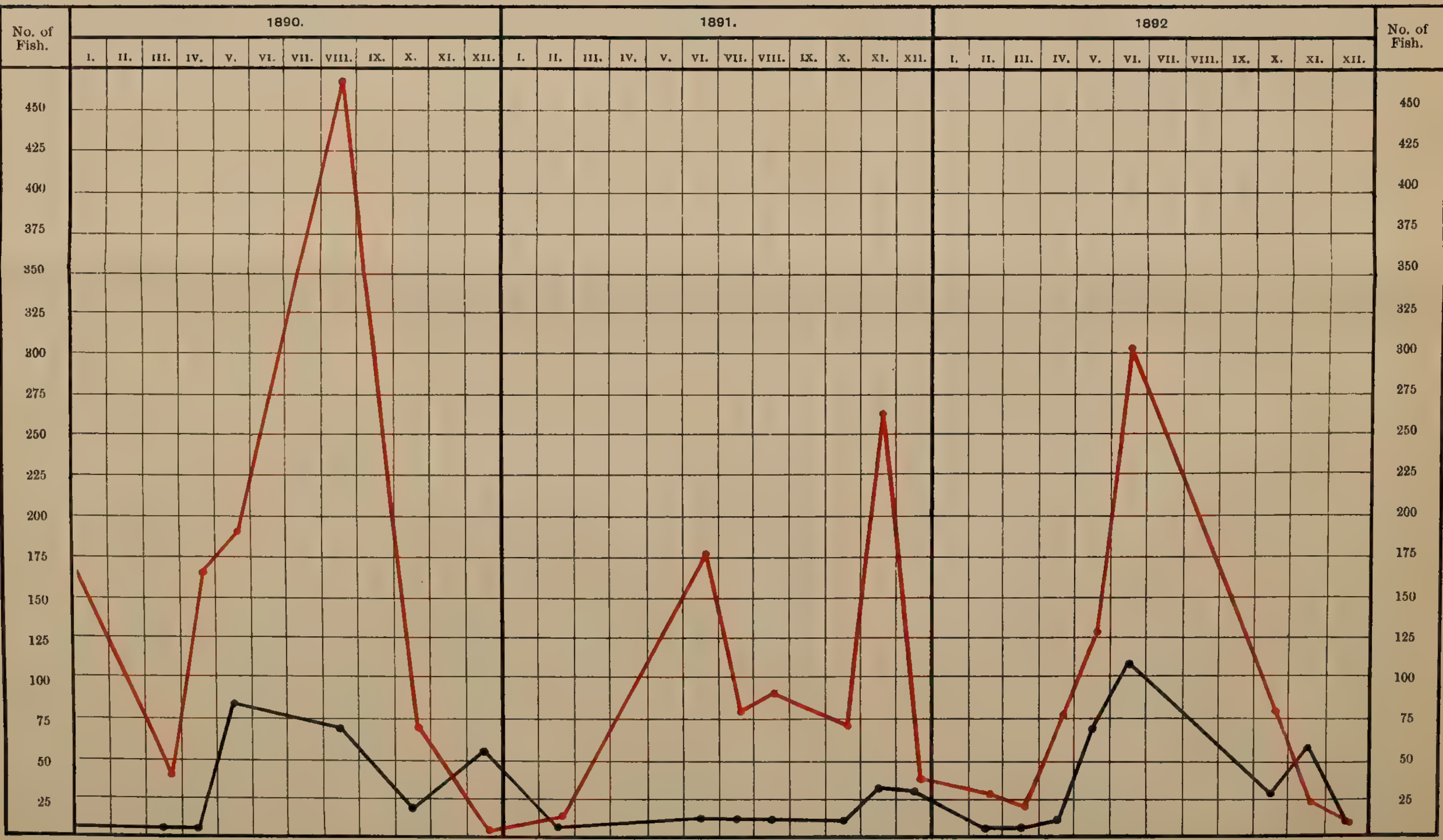
CHART showing the Results of the "Garland's" Trawlings.

The red line gives the average per "Shot" of flat fish; the black line gives the average per "shot" of round fish.

I. FIRTH OF FORTH—CLOSED AREA.



II. ST. ANDREW'S BAY—CLOSED AREA.



THE WEST COAST EXPEDITION OF THE 'GARLAND' DURING JULY AND AUGUST 1892. Report by W. ANDERSON SMITH.

Having joined the steamship 'Garland' on the 28th of July 1892, we started down the Firth of Forth in the very early morning, and dredged and trawled about six thousand clams from the clam beds of the Firth of Forth, placing them in the prepared receptacles on deck. This done, we conveyed them to the Moray Firth, where we chose the Guillane bank, off the mouth of Cromarty Firth, as the most suitable ground in the neighbourhood. The depth here was $10\frac{3}{4}$ fathoms at the north-east end of the bank, and there we placed the clams, at that time still in good health; in the hope of starting a fishing-bank in a central part of the Firth. Although there are clams at present in the Moray Firth, they are very scarce, and it is questionable whether the locality is specially suited for them in quantities; but the opportunity is now given to test the possibilities of this ground, seeing the spawning season was approaching, and those laid down will have every chance of depositing spawn on suitable ground. The temperature at the surface was 14·8° C, at the bottom 11° C.

This done we proceeded through the canal to the West Coast, and although we took a dredge or two and a trawl on the way, we did not meet anything of much importance, nor did we add to our previous knowledge obtained in the Linnhe Loch. A Montague's sucker came up in the dredge from 25 fs., a fish we have only taken in the laminarian zone previously in the west. Leaving Oban we proceeded north for Isle Oronsay, and trawled the Sound of Sleat on the way. Here we met with the first material of importance, finding a considerable number of smelts, *Argentina sphæræna,* in the trawl-net, although from the size of the mesh the greater number of any such fish must have passed through. We also met in considerable numbers the comparatively rare starfish *Astronyx Loveni,* Müller, of which we had only taken one specimen previously, and this in the same locality. Here we also took two specimens of *Isocardia cor* alive, along with *Rossia macrosoma* and *Nephrops norvegicus* in spawn. Amongst other common East Coast flat-fish we found a number of sail flukes, hitherto comparatively scarce in our West Coast records. The smelts proved to be of good size and in very fine condition, and we do not doubt that this fish is a resident of these northern waters in considerable quantities. The following day we proceeded to Loch Alsh, continuing up Loch Duich, which wild and picturesque loch we trawled from opposite Inverinet House down, dredging at the same time. The fish fauna we found of little interest, and indeed fish were very scarce, including sail fluke, witch, and long rough dab. The loch is too rough for trawling to any length, and the trawl soon came to a stand. *Astronyx* and *Pennatulæ* were numerous and fine, and a specimen of *Xantho rivulosa* was also procured. The character of the bottom did not promise any great wealth of fish life at any time. Leaving this loch we proceeded to Loch Carron, which we dredged and trawled from opposite Jeantown down towards the mouth, dredging again nearer shore above Strome Castle. That great quantities of herring sile were about was proved by the enormous numbers of gulls on the water. In some places they looked like a great line of froth from a distance, and this phenomenon was continually repeated throughout our expedition in many other lochs, as well as in the Minch alongside. The dogfish *Mustela vulgaris* taken in Loch Carron was full of young cuttlefish, while young *Nephrops* mainly constituted the food of the other fish taken. The loch otherwise only contained the usual captures, whether molluscan or other. From Loch Carron we were obliged to visit Portree before reaching Loch Torridon, the weather being somewhat rough and unfitted for work in the Minch. We also dredged Loch Torridon, as well as Shieldaig, a small loch off it, which proved richer in fish and fish food than the lochs previously examined. The character of the mollusca was curiously similar to that of Loch Creran, so much further south, and indeed it contained no forms that are not also procurable about Oban. We may mention that throughout the examination of the bottom of the sea we conterminously examined the Entomostraca by means of the tow-net attached to the trawl-head, while the surface-net was also in constant use. Although these nets undoubtedly sampled the floating fauna of the smaller class, they proved greatly inadequate to the purpose we had in view; and we have since, as the result of this experience, changed the character of these nets so as to supply a more important sample of this floating life, and to provide means of capture of some organisms that almost invariably passed them by.

From this loch the next loch examined was Loch Ewe. We carefully dredged this at the head to see if there were any remains of the so-called oyster beds, but failed to meet any signs, even in the way of dead shells. A portion of the loch has been marked off for mussel beds, which are claimed by the proprietor, but we saw no evidence of any care in their cultivation, or any sign of expenditure for the purpose of securing spat, or otherwise improving the character of the beds. All that was done, so far as we could observe, was to prevent the mussels being carried away. And this, without concurrent culture, by no means improves a mussel bed, which is all the better for being worked over. This loch was somewhat richer in fish than we anticipated, but we soon came to the conclusion that daylight fishing by the trawl in these lochs gives a very inadequate idea of the character of the fish fauna.

The main result of our operations with the trawl is to prove, if such were needed, that no important trawling operations of a mercantile character could ever be carried on in these confined waters. Neither the character of the bottom nor the character of the fish obtained is such as to induce trawling vessels to risk their trawls for any possible returns. As a rule, the fish in these lochs as taken by the trawl were of an inferior class, as well as in comparatively inferior condition. At the same time, it was impossible to trawl for any length of time, owing to the rough nature of the bottom, even when mud was supposed to be the prevailing bottom.

It may also be here acknowledged that while the trawl of the 'Garland' has proved extremely useful for scientific purposes, and given much information, its results cannot be taken as an example of what would be done by the ordinary beam-trawl of the larger steam-vessels. These not only trawl mainly at night, but their beam being raised higher above the ground, no doubt capture fish that escape the lower-set beam of the 'Garland.' We can therefore only speak comparatively of the work of this vessel, and do not pretend to compare it with the work of the greater commercial trawls. Still, the reduced trawl of the 'Garland' was able to cover ground where no large beam-trawl could pretend to run. Both *Funiculina quadrangularis* and *Pennatula phosphorea* were common in this loch, which does not in our experience promise well for prime fish.

The next loch to which we proceeded was Loch Broom. The weather was very unsuitable while we were in this loch and its neighbour Little Loch Broom. We do not, however, believe that the ordinary beam-trawler would ever risk their beams in these waters, and certainly our results were not such as to stimulate them to take the risk. They only supplied the common flat-fish, and these were mainly empty of food, while a haddock and a hake were equally badly nourished. The long rough dabs from deep water were, however, richly supplied with pteropods (*Spirialis*). One of the commoner jelly-fish taken in Little Loch Broom was occupied with a half-digested fish, that had become so closely incorporated as to be almost irremovable.

The lochs further north than this are so small in area and so rocky in character that in the prevailing weather we did not deem it advisable to risk their investigation. We consequently proceeded to Stornoway with the purpose of trawling Broad Bay. But here the weather did not favour us, and after coaling we continued on to Loch Erisort, where we again put down the trawl. On our way we also trawled in the Minch in 50 fathoms, bringing up a fair take of common fish (offal !), but of better quality and better fed. Pteropods abounded in the bottom tow-net, while Copepoda were also numerous and *Sagittæ* present. *Astronyx* and *Pennatulæ* were plentiful. It may be said here that throughout our experience, in the Hebridean lochs and the waters bordering thereon, the fish as well as the Entomostracan fauna were more numerous and of superior character—that is to say, the fish were not only of a better class and in better condition, but the floating fish food was more numerous and more nourishing.

Sea-trout and other salmonidæ seemed especially plentiful in this loch, and there can be no doubt that poaching is universal amongst the resident population, which is numerous. Shell-fish of a suitable character for bait are not plentiful, and we found *Tapes pullastra* in use to bait the hand-lines for codling and other fish, towards the head of the loch. The dredge in this loch was very rich in Mollusca, both as to variety and number. The next loch towards the south is Loch Shell, very open to the Minch, and better supplied with fish than those that are more contained. Like most of the lochs we had examined up till then, as well as those afterwards investigated, the muddy bottom was rich in magnificent *Pennatulæ.* These *Pennatulæ* in many cases showed that they were a favourite food of the starfish we have mentioned (*Astronyx Loveni*), which came up in large numbers in various localities throughout the expedition. Large quantities of their luscious *polypi* were also fed upon by *Arcturus longicornis*, a crustacean which we have also found elsewhere to prey upon this zoophyte. This muddy ground may therefore be the means of supplying a very valuable food to many classes of fish, not only as providing food for Crustaceæ, but as being rich in annelids of many species, some of great size and beauty. We regret that owing to our inability to make full use of the opportunities supplied by the 'Garland,' through lack of assistants, a proper collection of annelids could not be made; and we consider that in any future expedition, facilities should be provided for the collection of this, one of the most valuable of all classes of fish food. The net of the 'Garland' failed to capture an adequate supply, even if we had had the proper means of differentiating and preserving them, in the midst of our other work. Annelids mainly constituted the contents of the stomachs of the fish taken here, which were naturally mostly flat-fish. A haul of the small seine on the shores of the Shiant Isles produced nothing but young *Gadus virens*, all richly coloured from dwelling amid the tangle: but the tangle zone was full of minute Crustacea, and abounded in Pteropods, giving evidence of no lack of food for certain classes of fish.

Loch Seaforth is one of the longest lochs in Scotland, but did not prove to be specially fitted for the use of the trawl, although the bottom is muddy. We here took a specimen of that rare fish the *Phycis blennoides*, and again met the Hebridean smelt, in fine condition. The picked dogs taken were heavy with young in various stages of development, and some had as many as five in the one tube and four in the other, from 5 to 7 inches in length. One of these voracious fish had its stomach filled with a huge jelly-fish, with red stinging tentacles, evidencing want of food supply to any great extent—and yet fish were good and plentiful at 26 to 40 fs. in this loch.

We here obtained the large stone-crab *Lithodes maia* for the first time in the Hebridean area, with fine Pennatulæ and a few *Rossia macrosoma.* One of the Norwegian lobsters was in spawn, and the tow-net showed pteropods numerous, with *Sagittæ* present.

All these Lewis lochs have a reputation for oysters, but there is no evidence that they are specially fitted for oyster-cultivation. The oysters are mainly the scattered rock-oysters prevalent around our western seaboard, and obtainable at low spring-tides. Suitable ground for the laying down of beds proved to be exceedingly scarce in any of the lochs we visited. While testing these lochs, with the trawl more especially, the dredge was used wherever it was thought advisable or possible, and often in places where the trawl could not be put down. The result was not such as we had deemed probable, even Mollusca being comparatively scarce, while Crustacea were throughout extremely rare. Species indeed proved interesting, but individuals were few. In Tarbert, Harris, we found the fishermen taking a few herring, but they proved to be gutpokes, and the fishermen had removed the stomachs ere we managed to obtain them. We therefore were unable to examine the character of their food. There was no ground for putting down the trawl. The same may be said of Loch Maddy, so that the next loch we were able to investigate was Loch Eport, in North Uist. This loch is far too shallow for the most part for anything but a dredge, and although of considerable length, and apparently rich in salmonidæ, as well as remarkable for the extraordinary water connection, we had no evidence of a special wealth either of mollusca or crustacea. The minuter crustacea amongst the tangle were common enough, but there was no sign of herring shoals or prevalence of other sea-fish. The dredge brought up great quantities of coralline material with multitudes of dead shells, but life was notable by its absence. Severe weather detained us some time in Loch Boisdale, which we fished carefully, but without important results. Indeed, we were here extremely disappointed with the character of the fish captured, seeing the floating food was plentiful, and the salmonidæ of the connecting fresh-waters are amongst the most famous in the islands. *Echini* were here specially large and fine, and the little *Echinocyamus*, which is a deep water species, was obtained alive amongst the shore species. *Solaster papposa* and *Goniaster Templetoni* were also fine. The latter we found throughout the region traversed, and commonly large and richly coloured. A topknot, one of the few captured on this expedition, was taken in Lochboisdale. Off Castlebay, Barra, the ground proved to be much richer, and the interesting crustacean, *Colocaris Macandreæ*, was taken in the mud in deep water. We should have liked much to have examined the great fishing-banks to the south of Barra Head, but our vessel was not equal to such work, more especially in the weather then prevailing, so that we were forced to proceed to Canna, for fear of being weather-bound in such an out-of-the-way corner. Off Canna we took the only black sole obtained during the expedition. It was of large size and in fine condition, but lacked the delicate flavour of the English fish. Another was captured about the same time to the north of Skye, and was looked upon there also as a rare fish. We did not obtain a single turbot throughout the expedition, but in the neighbourhood of Canna, as we had previously noted, the ground was much richer in life of all kinds than we had found further north. The floating life also proved to be of the rich character formerly observed. To the naturalist this is a most interesting locality,—more so, perhaps, than any other we had traversed,—while it has also proved from time to time a very rich centre for the herring fishery. A red gurnard was here taken, and it contained a young dragonet (*Callionymus lyra*).

It is to be regretted that to none of these isles has the telegraph yet been extended, so that although lobsters, white-fish, and herring are all abundant in their season, the lack of prompt communication by wire with the southern markets seriously impedes fishing operations.

As we had been forced out of our course by the weather, we were obliged to return to the north of Skye, where we spent some days filling up the gaps in our knowledge of that locality. We had heard much of the Gairloch and the ground outside as a resort of white-fish, and the fish obtained there were undoubtedly good, but very few. The fish go outside to deeper water at this season. Amongst them we again came upon the black-mouthed dogfish (*Pristiurus melanostomus*) with its beautiful golden-syrup tinted egg-cases ready to be deposited. The dredge proved much more interesting than the trawl in these waters, more especially in the neighbourhood of Croulin Island, where on a well-known fish-bank we found multitudes of *Pecten similis*, upon which the flat-fish of the district undoubtedly fed, as the deeper ground outside was largely composed of the dead valves of this dainty pecten.

As we found it impossible in the prevailing weather to test the central Minch, we returned to Oban to coal, and to meet Mr Thomas Scott, our naturalist and entomostracan specialist, whom we took on board with the object of examining the fresh-water Loch Morar, while the vessel completed the examination of Lochs Hourn and Nevis. Mr Scott has a special report of his examination of this interesting fresh-water loch and its fauna (p. 220). In Loch Hourn we captured the first ling taken during our whole experience with the 'Garland's' trawl in the west. We feel confident that if it trawled on the West Coast during the winter months this would not be the record. Smelt again appeared in our trawl from Loch Nevis, and the black-mouthed dogfish were also present in both Lochs Nevis and Hourn, in the latter in great numbers. In both lochs also *Astronyx Loveni* and *Funiculina quadrangularis* were plentiful and beautiful; while from Loch Hourn the largest holothuria of the expedition were captured (*Cucumaria frondosa* and *Phyllophorus drummondi*), as well as the quaint crustacean *Munida Rondeletii.* Herring were at that time plentiful both in Nevis and Hourn, but somewhat immature, and the fishermen were obtaining wretched prices for their fish, yet more than would have been obtained for the same class of fish on the East Coast at the same time. It is somewhat remarkable that we on no occasion throughout the expedition ever obtained a herring in the trawl; nor, although so many herring were about, did we capture any white-fish with herring in the stomach! This to us is a further evidence of the inadequate character of our examination, as the use of the long line, the seine-net, and the trammel-net would possibly have shown very different results.

It will be necessary in future, in order to do full justice to such an examination, to not only have more of our naturalists on board, but to employ more effective apparatus. Our proposals in this direction will be found elsewhere.

From Loch Linnhe two specimens of *Isocardia cor* were obtained alive, proving the presence of this fine shell still in these waters, from which they have not been often captured of late years.

We had the advantage of the skilled aid of Mr Alfred Brown, author of "The Mollusca of the Clyde," during the early part of the expedition, for which we specially thank him. The report of Mr Brown on the mollusca taken during the expedition is appended.

REPORT ON MOLLUSCA. By Alfred Brown.

The methods adopted for the purpose of obtaining specimens of the fish frequenting the various lochs visited by the 'Garland,' and of the food of such fish, were not of a kind very favourable to the collecting of mollusca. The trawl was so wide in the mesh that most of the shell-fish escaped; and the mud, which might be expected to yield the smaller species, was generally entirely washed out.

The dredge, when used, was usually permitted to fill itself at once by one deep bite into the subsoil, and so produced but few mollusca, yielding more commonly a harvest of mud-frequenting annelids; whilst the tow-net gave us only pteropods of one species in vast numbers, as well as the fry of littoral shell-fish, such as *Lacuna* and *Rissoa.*

Giving due allowance for these defects in the method of collecting, it cannot but remain a subject for surprise that the mollusca should have been taken in such small numbers and of so few species. There is an almost total absence of the predatory gasteropods *Fusus*, *Buccinum*, *Natica*, &c., and as there is an equally remarkable absence of the pierced valves of Conchifera, which form their principal food, we must conclude that the whelks in question do not exist in any considerable numbers in these waters.

No opportunity occurred of examining Broad Bay in Lews, which is to be regretted, as that bay is noted for the number and variety of its bivalves, and it would have been interesting to note if the presence of such a store of food had any effect on the numbers of *Fusi*, *Buccina*, &c., in that bay.

The only point worth noticing in relation to this division is the presence in several of the lochs in Lews of deep sea forms in very shallow water; such species as *Nucula nucleus* and *nitida*, *Corbula* and *Leda* being taken in 8 or 10 feet of water, in company with the *Littorinæ* and *Trochi*, which are strictly confined to the laminarian zone—the forms named being characteristic of the coralline and lower zones.

It is usual to expect in going north that the shells should present a more robust and developed appearance than in more southern waters, but this was not the case on this cruise—the shells, on the contrary, presenting a rather depauperated appearance, certainly below the average in point of size.

LIST OF THE MOLLUSCA OBTAINED.

Loch Hourn.

Natica Alderi,	3
Trichotropis borealis,	1
Nassa reticulata,	1
Trochus millegranus,	3
,, *tumidus*,	1
Littorina rudis,	1
,, *obtusata*,	2
Chiton (species),	1
Kellia suborbicularis,	1
Solen ensis,	1
Mytilus modiolus,	1
Saxicava rugosa,	1
Tellina donacina,	4
Venus ovata,	4
Lucina spinifera,	1
Psammobia tellinella,	1
Mactra solida var. *elliptica*,	12
Cardium fasciatum,	valve
Pecten tigrinus,	valve
Lucinopsis undata, fragments.	
Thracia papyracea,	1

LOCH NEVIS, 25th August 1892.

Turritella terebra,	18
Natica Alderi,	1

Cyprina Islandica,	8
Venus ovata,	12
,, *fasciata,*	1
Artemis lincta,	4
Corbula gibba,	5
Nucula sulcata,	valves
,, *nitida,*	8
Leda pygmæa,	1
Solen pellucidus,	2
Saxicava rugosa, var. *arctica,*	2
Pecten varius, striatus, tigrinus and *opercularis,*	valves
Cardium minimum,	2
Axinus flexuosus,	2
Thracia,	fragments
Scrobicularia alba,	45
Crania anomala,	1

LOCH BOISDALE, 13--21 fathoms, 15th August 1892.

Cypræa Europæa,	14
Erato lævis,	1
Nassa incrassata,	12
Philine aperta,	1
Akera bullata,	6
Lacuna divaricata,	3
Natica Alderi,	1
Trochus tumidus,	1
Turritella terebra,	1
Velutina lævigata,	1

Modiolaria marmorata,	4
Cardium fasciatum,	1
,, *exiguum,*	1
Pecten opercularis,	2

CROULIN, 16 fathoms.

Emarginula fissura,	1
Tectura virginea,	2
,, *fulva,*	1
Trochus tumidus,	1
,, *millegranus,*	1
Natica Montacuti,	1
Trichotropis borealis,	1
Trophon barvicensis,	1
Cylichna cylindracea,	1
Chiton (species),	3

Pecten tigrinus,	1
,, *striatus,*	1
,, *similis,*	6
Nucula nucleus,	1
Leda pygmæa,	2
Cardium fasciatum,	4
Artemis lincta,	1
Lima elliptica,	valve
Terebratula caput serpentis,	3

LOCH LINNHE, 22nd August 1892.

Odostomia rufa, var. *fulvocincta,*	2
,, *conoidea,*	1

Leda minuta,	13
Nucula nucleus	5
Venus ovata,	2
Terebratula caput serpentis,	2

GAIRLOCH, 40 fathoms, Trawl.

Bulla utriculus,	2
Actæon tornatilis,	3

Venus ovata,	1
Cardium minimum,	2

OFF BARRA, 17 fathoms.

Trochus cinerarius,	1	*Psammobia tellinella,*	4
,, *zizyphinus,*	1	*Tellina donacina,*	valves
,, *tumidus,*	15	,, *pusilla,*	2
,, *Montacuti,*	12	*Artemis lincta,*	1
Nassa incrassata,	9	*Venus ovata,*	2
Natica Alderi,	12	,, *fasciata,*	1
,, *Montacuti,*	2	*Tapes virgineus,*	3
Phasianella pulla,	4	*Circe minima,*	2
Eulima polita,	1	*Cyprina Islandica,*	1
Aporrhais pes pelicani,	fragments	*Cardium fasciatum,*	2
Cypræa Europæa,	1	*Pecten varius,*	valve
Tectura virginea,	1	*Pectunculus glycimeris,*	1
Chiton (species),	1		

OFF BARRA, dredged, 16 fathoms, 16th August 1892.

Trochus tumidus,	22	*Tapes virgineus,*	4
,, *Montacuti,*	5	*Artemis lincta,*	1
,, *zizyphinus,*	2	*Venus fasciata,*	7
,, *magus,*	1	,, *ovata,*	1
,, *cinerarius,*	1	*Circe minima,*	2
Cypræa Europæa,	3	*Pecten tigrinus,*	valves
Natica Alderi,	6	,, *pusio,*	valves
Nassa incrassata,	4	*Psammobia tellinella,*	24
Aporrhais pes-pelicani,	fragments		and many valves
		Tellina donacina,	3
		Cardium fasciatum,	3
		,, *norvegicum,*	valve
		,, *echinatum,*	valve
		,, *nodosum,*	2
		Thracia papyracea,	1
			and valve

SLEAT SOUND, 50 fathoms, mud.

Pleurotoma brachystoma,	1	*Leda pygmæa,*	6
Rissoa abyssicola,	2	*Scrobicularia alba,*	6
		Axinus flexuosus,	1
		Corbula gibba,	1

LOCH CARRON, 50 fathoms, sandy mud.

Odostomia rufa, var. *fulvocincta,*	3	*Scrobicularia alba,*	6
Cylichna nitidula,	3	*Lucina spinifera,*	6
		Mya arenaria,	1
		Axinus flexuosus,	4
		,, *ferruginosus,*	2
		Corbula gibba,	5
		Leda pygmæa,	10
		Nucula nitida,	3
		,, *tenuis,*	3

LOCH CARRON (TOWNET), small gravel and mud, 50 fathoms.

Dentalium entalis,	2	*Scrobicularia alba,*	10
Tectura fulva,	1	*Astarte compressa,*	1
Odostomia rufa, var. *fulvocincta,*	2	*Pecten similis,*	1
,, *pallida,*	1	*Cardium nodosum,*	1
Cylichna nitidula,	2	*Nucula tenuis,*	3
		Leda pygmæa,	7
		Axinus flexuosus,	5
		Corbula gibba,	8
		Lucina spinifera,	11

Loch Duich, 50 fathoms, mud.

Rissoa striata,	4	*Scrobicularia alba,*	2
		Axinus ferruginosus,	2
		Leda pygmæa,	12

Loch Broom, 18 fathoms, muddy sand.

Cylichna cylindracea,	4	*Scrobicularia alba,*	2
		Axinus flexuosus,	3
		Lucina spinifera,	1
		Montacuta bidentata,	4
		Nucula nitida,	1

Loch Maddy, 17 fathoms, hard ground, and (part) sandy mud.

Dentalium entalis,	1	*Scrobicularia alba,*	7
Helcion pellucidum,	2	*Corbula gibba,*	10
Buccinum undatum,	1	*Axinus ferruginosus,*	5
Odostomia acicula,	2	*Cyprina Islandica,*	3
,, *albella,*	1	*Montacuta bidentata,*	30
Rissoa parva,	4	*Lima subauriculata,*	valves
,, ,, *v. interrupta,*	5	*Thracia pubescens,*	valves
,, *striata,*	2	,, sp.	2
,, *punctura,*	1	probably the young of *pubescens.*	
,, *vitrea,*	2	*Cardium nodosum,*	valves
Erato lævis,	fragment	,, *echinatum,*	valves
Philine scabra,	3	*Leda pygmœa,*	17
Cylichna cylindracea,	3	,, *minuta,*	1
,, *nitidula,*	8	*Nucula nucleus,*	8
Chiton asellus,	many		

Loch Erisort.

In a haul of the dredge taken just within the Channel connecting this loch with the sea a large quantity of sandy nullipore and dead shells was brought up. In a superficial examination of this, I observed several species which we had not hitherto found alive, such as *Pectunculus glycimeris, Trochus Montacuti, Circe minima,* and a perfect (but dead) example of *Erato lævis.* Time did not admit of a more complete examination of this lot.

Shiant Islands and Loch Maddy.

A visit to the shores here at low water of spring tide did not reveal any special features; the mollusca were of the usual character found in such localities and consisted of very large limpets and *Trochi* and vast quantities of *Rissoa, Homalogyra, Skenea,* and *Lacuna,* all of commonly distributed species. The common *Doris* (*tuberculata*) and an *Eolis* were also observed, also fry of the blue striped limpet (*Helcion pellucidum*), in great abundance, but no adult examples were obtained of this species.

SECTION B.—BIOLOGICAL INVESTIGATIONS.

I.—AN EXPERIMENTAL INVESTIGATION ON THE MIGRATIONS AND RATE OF GROWTH OF THE FOOD-FISHES.

By Dr T. Wemyss Fulton, F.R.S.E., Superintendent of Scientific Investigations.

Introductory.

There is probably no subject connected with sea-fisheries about which more has been written than the migrations of fishes, and there are few points in the life-history of fishes about which we are at the present day more ignorant. A great deal is now known concerning the food, propagation, development, distribution, &c., of sea-fishes, but beyond general information as to the movements of the great shoals at certain seasons, little definite knowledge has been acquired. The question is, nevertheless, one of importance from the practical point of view, and is becoming of greater importance year by year, as the necessity for further regulation of the fisheries appears more obvious. Do the fish in territorial waters, from which an effective mode of fishing—beam-trawling—has been excluded, remain there for any length of time; if defined areas are protected in the offshore waters, how long, and at what seasons, are the various species of fish likely to remain within it or to wander from it, and what is the extent of surrounding water for which such an area may become a 'feeder,' say, of valuable flat-fish; what is the relation between the spawning grounds of the herring and the seat of the great herring fisheries, *e.g.*, between the Lochfyne fishing and the spawning beds at Ballantrae, about which regulation is at the present moment demanded? Something must be ascertained about the migrations of the fishes before these fishery problems can be thoroughly understood.

The migrations of the herring have attracted attention for centuries, and a large volume could be written about the theories promulgated, which were almost all erroneous and very often mischievous in their results. Examples may be found in the histories of all the great herring fisheries of Europe—Scanian, Bohuslän, Norwegian, Dutch and British. The theory which held sway for centuries was the 'icy-sea' or polar theory originated apparently by Gilpin, which was elaborated with extraordinary minuteness, modified from time to time in its details, and only finally abandoned comparatively late in this century. It assumed that the herring was bred in the Arctic Seas, that dense shoals led by a large fish, 'the 'king' (always returned to the water) moved south early in the year and broke up into smaller shoals, which travelled along various coasts and returned later in the year to the Polar Sea. When it was at last recognised that herrings spawned off our coasts and remained at certain places throughout the winter (late last century), the herrings were divided into 'foreign herrings' (from the icy seas) and 'home-bred' herrings. I only mention this theory to show how injuriously general ideas of this kind may affect the fisheries; for it was under its influence that the regulations of the buss fishing were drawn up, and hundreds of thousands of pounds squandered. It was even proposed in a Government report to have vessels stationed at Shetland to watch for the advent of the northern shoals, and to give notice down the east and west coasts to enable the fishermen to fish in the proper places.

The views now current assume that fish do not as a rule travel far, and competent fishery authorities believe that even Firth herrings (*e.g.*, Lochfyne, Firth of Forth) do not leave the Firths, but merely disperse into deeper water. Similarly, it is generally held that flat-fish do not wander to any considerable distance. I believe the tendency of opinion is to go too far in this direction; but the question can only be settled by experiments and careful observations.

The experiments, the results of which are detailed in the following pages, were begun four years ago. In beginning the experiments preliminary difficulties had to be considered, namely, how the fish could be marked in such a way as to make the marking permanent, conspicuous enough to be easy of recognition to those who caught the fish, without rendering the latter too conspicuous to its enemies, and capable of indicating the necessary particulars of the experiments, such as where and when the fish was marked, its size, &c. It was also desirable that the method should injure the fish as little as possible, and be inexpensive, since large numbers had to be dealt with. Many expedients were tried. Pigment was used, but the fish died; and this method was otherwise unsatisfactory. It was decided that the method most likely to succeed was to attach a label or tag, bearing a number, to some part of the fish. In order to ascertain what suitable substance might best resist the action of the sea, pieces of leather, gutta-percha, india-rubber, lead, copper, zinc, brass, &c., were immersed for several weeks in sea-water, and brass was ultimately selected as the substance which was, on the whole, most satisfactory. It was also decided that the tag should be fastened round the tail of the fish. A thousand thin brass circular discs, three-quarters of an inch in diameter, were procured, each having a consecutive number stamped on it, and pierced with a small hole at opposite sides by which it could be fastened to the fish. At first, thin aluminium wire was used for this purpose, from the fact that sea-water does not corrode it, and over 500 fishes had the discs thus attached to them, but not one of these was recaptured; and check experiments on fish in the tanks showed that the aluminium becomes brittle and breaks. Black silk cord was eventually employed, and has proved quite satisfactory, resisting the action of the sea-water for at least more than two years. The disc was also found to be rather large, especially for small fish, and the one now employed is oval and smaller.

While the method described has been found satisfactory in tracing the migration of the fish, it has a disadvantage from another point of view. As was anticipated, these experiments throw considerable light on the important question of the rate of growth of fishes; but owing to the fact that the ligature around the tail causes abrasion in nearly all cases, the natural growth is retarded. This is referred to more fully later on. In order if possible to obviate this disadvantage, experiments were made by attaching very small oblong discs of aluminium and silver to the outer surface of the opercular covering of fish living in the tanks (without penetrating to the inner surface), but in the course of a few months they all came off, and even this comparatively slight interference was found to check the growth of the fish, which were measured and weighed periodically. Some of them, indeed, fell off in weight, and took little food. Recently another method has been tried by securely fixing a small oblong brass tag, just large enough to contain the number, to the shank of a small fish-hook, and imbedding the hook in the thick fleshy part of the back. Sufficient time has not elapsed to show

how this mode will work, but it has an advantage in being quickly performed—a matter of importance when one has to deal with a large number of fish in a short time, as in experiments on herrings—and it is assumed that the irritation caused will be less than with a ligature around the tail.

The experiments have been made almost entirely on board the 'Garland,' during the last four years. A number of young turbot and brill, caught in salmon stake-nets, have also been marked and liberated, and several hundreds of herrings were marked and set free at Ballantrae Bank and in Lochfyne. On board the 'Garland' the living fish are transferred to a tub of sea-water; lively and active ones are then selected, and a record is made on a printed form of the date and hour, the locality, the kind of fish and its exact length, and the number on the label or disc attached to it, and it is then returned to the sea. The operations on board the 'Garland' were conducted by Mr Scott and Mr Liston (the mate), almost all the records being kept by Mr Scott. Since the experiments were begun between 3000 and 4000 fishes have been thus marked at various parts of the coast and returned to the sea; but as the majority have been dealt with in the Firth of Forth and St Andrews Bay, and all those, except one, which have come into my possession after recapture have been marked and liberated in one or other of these areas, it will be well to limit attention in the meantime to this group. During the four years mentioned, 2586 fishes have been marked and set free in the Firth of Forth and St Andrew's Bay, 1490 in the former, and 1096 in the latter. The numbers of the different kinds of fish are represented in the accompanying Tables:—

	Plaice.	Common Dab.	Lemon Sole.	Flounder.	Witch Sole.	Long Rough Dab.	Turbot.	Brill.	Sail Fluke.	Cod.	Haddock.
Firth of Forth, .	515	155	157	26	11	179	..	..	1	189	60
St Andrew's Bay, .	735	182	16	18	1	19	4	2	..	7	25
Total, .	1250	337	173	44	12	198	4	2	1	196	85

	Ling.	Whiting.	Gurnard.	Thornback Ray.	Gray Skate.	Starry Ray.	Sandy Ray.	Angler.	Catfish.	Lumpsucker.	Dragonet.
Firth of Forth, .	2	14	15	62	19	17	..	50	15	2	1
St Andrew's Bay, .	..	2	54	9	4	9	1	4	3	1	..
Total, .	2	16	69	71	23	26	1	54	18	3	1

Notice of these experiments was given to the Fishery Officers and correspondents and others along the coast; and the fishermen were informed that on forwarding any of the marked fish a small reward would be paid to them.* Notwithstanding this intimation many of the fish were re-captured without being forwarded to the Fishery Officers or myself, partly from ignorance of the experiments on the part of those who obtained them, and partly from the disinclination of some of the trawlers to assist in the matter. Of the 2586 fishes referred to above as having been marked and liberated, 130 have been re-captured, and particulars obtained about them, the great majority having been sent to me with the brass disc attached. Of the 1490 set free in the Firth of Forth, 55 have been again caught; while 74 of the 1096 liberated in St Andrews Bay have been re-captured. By far the greater number have been plaice. Of the 515 plaice marked in the Firth of Forth, 36 have been again obtained; and of the 735 marked in St Andrews Bay, no less than 67 have been re-caught, making a total of 103 marked plaice re-captured, or 8·2 per cent. of those liberated. The number of common dabs which had the labels attached to them was 337, of which 155 were set free in the Firth of Forth, and 182 in St Andrews Bay. The total number again captured was eleven (six from the Firth of Forth, and five from St Andrews Bay), or 3·2 per cent. of those replaced in the sea. Of 196 cod dealt with, 10 were re-captured, or 5·1 per cent. The only other marked fish obtained were two thornbacks out of 71; one turbot out of 4; one gray skate amongst 23; and one lemon sole from among 173. None of the long rough dabs were re-captured, although 198 were marked and liberated, and none of the 85 haddocks, or 69 gurnards, or 54 anglers. There is evidence of many fishes having been caught without the label, but with a mark on the tail showing that a label had been attached, and Mr Peter Sim informs me he has caught plaice in this condition as far out as the Bell Rock.

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* I have to thank Mr Mair and Mr Murray, the Officers of the Anstruther and Leith Districts, Mr Peter Sim, Broughty-Ferry, Mr James Gourlay, St Andrews, and Mr Gillies, Largo, for sending me marked specimens caught. Professor M'Intosh also kindly forwarded to me the specimens which came into his possession.

I.—The Migratory Movements.

As has been said, the main object of these experiments was to ascertain the migrations which take place among the food-fishes, and an examination of the tabulated results brings out some points of interest. The question may naturally be raised, whether or not the presence of an irritating body in contact with the skin, such as the small brass disc and silk cord used in the experiments, causes material interference with the normal migratory movements of the fish. It is of course difficult or impossible to give a decided answer to this question. But it seems to me that it does not, because in some cases the marked fish have remained, even for long periods, at about the same place, without travelling far, while in other cases specimens of the same species have gone considerable distances; and in each of these cases the irritation caused by the disc was, so far as can be judged, equal in amount. In considering the movements of the fish in these experiments, it will be well to begin with the plaice.

1. Plaice.

As stated above, 103 of the 1250 plaice marked and liberated were recovered, or 8·2 per cent.; but from the facts described previously as to the insecurity of the aluminium wire at first employed, the fish thus marked may be disregarded, and if that be done then the percentage of re-captures of plaice rises to 9·9 per cent., or nearly one in ten. Particulars in regard to each of the plaice which were recovered are given in the accompanying Table; but, before discussing these, a few words may be said on certain general aspects. It may be said that the great majority of the specimens marked were immature, *e.g.*, under the size at which sexual maturity is first reached, ranging, as a rule, between 8 and 12 inches, the smallest being 6½ inches. Only 132 were above 12 inches, the size at which the male fish may be regarded as reaching maturity; and only nineteen were above 15 inches (four of these being 17 inches long), and this is the size about which the female attains maturity. The figures given refer to the size of the fish when returned to the sea; and they must be kept in view in considering the movements of the fish. The Table shows that only twenty-one specimens of 12 inches or above that size were recovered, and of these only one was above 15 inches in length. These experiments may therefore be said broadly to deal with the migratory movements of immature plaice. The period which elapsed between the liberation and re-capture of the fish varied in different cases from 2 days to 819 days (or 2 years and 3 months); the average being 239·6 days, or 8 months. It will be seen at once, by a glance at the Table, that the extent of the movement does not correspond to the length of time the fish was free in the water. In assigning a certain number of miles * as the 'distance travelled,' I have measured the distance between the place of liberation and the place of recovery in a straight line, or one as direct as possible. It is of course obvious that the fish may in the interval have travelled much further; indeed, it may be said that this must almost always have occurred, but there is nothing to show the extent of this movement. One point comes out clearly in contrasting the tabulated results of the experiments on the cod and common dab with those on the plaice, namely, the comparative stationariness of the latter. The number of miles between the points of liberation and re-capture in the case of the plaice varies from practically *nil* to 28. The average for all the cases in which the distance is given is 6·15 miles, and the mean period of freedom was, as we have seen, 239·6 days. But certain of the records of the distance travelled by fish captured by trawlers must be regarded with doubt. The seven captured by trawlers, of which particulars are given, are represented to have travelled from 5 to 28 miles; the average distance being 16·6 miles, and the average period of immersion 265·9 days. Some of these records referring to fish at or above the size at which sexual maturity is reached are probably approximately correct; but others are, I think, erroneous, such, for instance, as the case where a plaice of 11 inches long is said to have gone offshore 28 miles in 71 days. From the fact that beam-trawling is prohibited under penalties in the waters where most of the fish were liberated, it may have been thought desirable to represent them as having been captured further from the boundary of the closed waters than was actually the case; and if the few plaice caught by trawl are disregarded, we find the mean distance travelled by the others is 5·1 miles in an average period of 241 days. As is shown below, the range of movement of another flat-fish, the common dab, is very much greater, the average distance travelled by the marked specimens of this fish having been 14·5 miles in a mean period of 178·3 days.

Some of the results may be referred to in detail. One plaice, $10\frac{1}{8}$ inches in length, liberated in the Firth of Forth, at Station VI., opposite Pittenweem, on 7th November 1889, was re-captured on Abertay Bank at the mouth of the Tay on 26th March 1891, after the lapse of 504 days, having travelled probably along the coast, from the Firth of Forth and across St Andrews Bay, a distance of at least 19 miles. Another, $14\frac{1}{4}$ inches in length, was liberated at Station V., near the Isle of May, on 20th October 1890, and was re-caught half-a-mile east from Granton Harbour on 27th October in the following year; it was therefore free for 372 days, and had gone 20 miles. Two specimens, $8\frac{1}{2}$ and $9\frac{1}{4}$ inches long, set free together off Fiddra, on 17th July 1891, were taken at the same place, half-a-mile off Leith, one on the 27th May, and the other on 7th June 1892, each

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* The miles are geographical miles.

PLAICE.

No.	Place where Liberated.	Date of Liberation.	Date of Recapture.	No. of Days free.	Place where Recaptured.	Size when set Free.	Size when Re-captured.	Distance Travelled.
						Inches.	Inches.	Miles.
1	Station VI., Forth	Nov. 7, 1889	Mar. 26, 1891	504	Abertay Bank, St Andrews Bay	$10\frac{1}{8}$	$12\frac{4}{5}$	19
2	,, ,, ,,	,, ,, ,,	May 27, 1890	140	2 miles off Elie	$13\frac{1}{8}$	13	3
*3	,, V., St Andrews Bay	,, 13, ,,	,, 19, ,,	126	3 ,, E. of Bell Rock	$10\frac{3}{4}$	$10\frac{3}{5}$	11
4	,, IV. ,,	,, ,, ,,	Apr. 10, ,,	148	"St Andrews Bay"	$9\frac{1}{2}$	?	?
5	,, ,, ,,	,, ,, ,,	Oct. ,, ,,	331	3 miles N.E. St Andrews	$10\frac{1}{2}$	$10\frac{1}{2}$	?
6	,, ,, ,,	,, ,, ,,	Apr. 16, 1891	519	Carnoustie Bay	$11\frac{1}{2}$	?	5
7	,, ,, ,,	,, ,, ,,	Feb. 8, 1890	87	Off St Andrews	$12\frac{1}{4}$	$12\frac{1}{2}$	?
8	,, ,, ,,	,, ,, ,,	Mar. ,, 1892	...	,, ,,	9	?	?
9	,, III. ,,	,, 14, ,,	Feb. 7, 1890	85	2 miles N. St Andrews	$11\frac{3}{4}$	$11\frac{1}{2}$	1
10	,, ,, ,,	,, ,, ,,	,, 11, 1892	819	Tents Muir Sands	$10\frac{3}{8}$	$11\frac{2}{5}$	5
11	,, II. ,,	,, ,, ,,	Mar. 10, 1891	481	5 miles N.E. St Andrews	$10\frac{5}{8}$	$10\frac{3}{4}$	4
12	,, ,, ,,	,, ,, ,,	Apr. ,, 1890	...	Tents Muir Sands	$11\frac{1}{2}$	?	$5\frac{1}{2}$
*13	,, ,, ,,	,, ,, ,,	June 2, ,,	200	5 miles N.E. Bell Rock	$12\frac{1}{2}$	$12\frac{7}{10}$	$12\frac{1}{2}$
14	,, I. ,,	,, ,, ,,	,, 16, 1891	579	Pier Head, St Andrews	$10\frac{1}{8}$	"10"	2
15	,, ,, ,,	Oct. 25, 1890	Mar. 6, ,,	132	4 miles N.E. St Andrews	$10\frac{3}{4}$	$10\frac{1}{2}$	4
16	,, ,, ,,	,, ,, ,,	Dec. 8, 1890	44	West Ferry, Tay	10	10	11
17	,, IV. ,,	,, 23, ,,	†Feb. 1892	...	. . . . . .	10	?	?
18	,, V., Forth,	,, 20, ,,	Oct. 27, 1891	372	½ mile E. Granton Harbour	$13\frac{3}{4}$	$13\frac{3}{4}$	20
*19	,, ,, ,,	,, ,, ,,	,, 26, 1892	736	25 miles S.E. Isle of May	$14\frac{1}{4}$	?	27
20	,, ,, ,,	,, ,, ,,	Feb. 4, 1891	106	1 mile off Buckhaven	$14\frac{3}{4}$	?	10
21	,, II. ,,	June 22, 1891	,, 10, 1893	598	Kincraig Point	$11\frac{3}{4}$	$14\frac{2}{5}$	$4\frac{1}{2}$
22	Near Station I., Forth	,, ,, ,,	,, 3, 1892	226	Off Largo	$10\frac{1}{2}$	$10\frac{9}{10}$	$8\frac{1}{2}$
23	Station ,, ,,	,, 26, ,,	Sept. 22, ,,	453	Off Kincraig Point	$12\frac{1}{4}$	$13\frac{3}{4}$	11
24	,, ,, ,,	,, ,, ,,	Apr. 2, ,,	280	½ mile from Leith Pier	12	?	5

* Trawler. † Label found in Boat.

PLAICE—*continued.*

No.	Place where Liberated.	Date of Liberation.	Date of Recapture.	No. of Days Free.	Place where Recaptured.	Size when set free.	Size when Re-captured	Distance Travelled.
						Inches.	Inches.	Miles.
25	Near Station I., Forth . .	June 27, 1891	May 2, 1893	674	Kirkcaldy Bay . . .	$11\frac{3}{4}$	12	4
26	Station IV., St Andrews Bay	July 2, ,,	Apr. 16, 1892	292	W. of Abertay Light . .	$9\frac{1}{2}$	$10\frac{1}{2}$	4
27	,, ,, ,, .	,, ,, ,,	Feb. 13, ,,	226	Off Abertay Bank . .	11	$11\frac{1}{10}$	3
*28	,, ,, ,, .	,, ,, ,,	Aug. 26, 1891	53	? Landed from a Trawler .	$10\frac{1}{2}$	†$10\frac{3}{10}$	...
29	,, ,, ,, .	,, ,, ,,	Oct. 16, ,,	106	At mouth of Eden . .	$8\frac{1}{4}$	...	2
*30	,, II. ,, .	,, 3, ,,	,, 2, ,,	91	'Off St Andrews Bay' . .	$10\frac{3}{4}$	11	...
31	,, ,, ,, .	,, ,, ,,	Apr. 21, 1892	295	$\frac{1}{4}$ mile N. Kingsbarns . .	$11\frac{3}{4}$	$11\frac{9}{10}$	3
32	,, I. ,, .	,, ,, ,,	Jan. 30, ,,	211	1 ,, off Tents Muir Sands .	$10\frac{1}{2}$	$10\frac{5}{8}$	5
33	,, ,, ,, .	,, ,, ,,	Feb. 13, ,,	225	Abertay Bank . . .	$11\frac{1}{2}$	$11\frac{3}{10}$	6
34	2 miles N. Fiddra . . .	,, 17, ,,	June 7, ,,	325	$\frac{1}{2}$ mile off Leith . . .	$8\frac{1}{2}$	$8\frac{7}{10}$	12
35	,, ,, . . .	,, ,, ,,	July 26, ,,	384	. . . .	$8\frac{5}{8}$	10	...
36	,, ,, . . .	,, ,, ,,	May 27, ,,	314	$\frac{1}{2}$ mile off Leith . . .	$9\frac{1}{4}$	$9\frac{7}{10}$	12
37	Station III., Forth . .	,, 18, ,,	Apr. 7, ,,	263	100 yards off Leith Pier .	11	11	7
38	,, II., St Andrews Bay	,, 22, ,,	May 15, ,,	297	2 miles S.E. Fairway Buoy .	$9\frac{1}{2}$	$9\frac{3}{5}$	4
39	,, ,, ,, .	,, ,, ,,	Apr. 21, ,,	273	Abertay Bank . . .	$11\frac{3}{8}$	$11\frac{3}{10}$	5
40	,, ,, ,, .	,, ,, ,,	Mar. 24, ,,	245	2 miles N. St Andrews . .	?	11	2
41	,, ,, ,, .	,, ,, ,,	‡Feb. 29, ,,	...	. . . .	$7\frac{1}{4}$	...	...
42	,, ,, ,, .	,, ,, ,,	Apr. 22, ,,	274	N. Abertay Lightship . .	$9\frac{3}{4}$	$9\frac{9}{10}$	7
43	,, ,, ,, .	,, ,, ,,	Mar. 23, ,,	244	Mouth of Eden . . .	$8\frac{3}{4}$	$8\frac{1}{2}$	6
44	1 mile off Cockenzie . .	Aug. 5, ,,	July 27, ,,	354	Off Portobello . . .	$8\frac{3}{4}$	$10\frac{1}{4}$	4
45	,, ,, . .	,, ,, ,,	Oct. 30, 1891	87	1 mile E. Fisherrow . .	$8\frac{3}{4}$	$8\frac{7}{8}$	$3\frac{1}{2}$
46	Off Portobello . . .	,, 20, ,,	Apr. 25, 1892	248	$\frac{3}{4}$,, off Portobello . .	11	$11\frac{2}{5}$	...
47	Station IV., St Andrews Bay	,, 24, ,,	,, 3, 1893	587	Mouth of Eden . . .	$9\frac{1}{4}$	$11\frac{1}{4}$	2
48	,, ,, ,, .	,, ,, ,,	Mar. 25, 1892	213	Off Eden	11	11	2
49	,, ,, ,, .	,, ,, ,,	,, 10, ,,	198	1 mile N. St Andrews . .	$10\frac{1}{2}$	$10\frac{3}{5}$	$1\frac{1}{2}$
50	,, II. ,, .	,, 25, ,,	§Feb. ,, ,,	...	. . . .	$11\frac{3}{4}$	...	...
51	,, III. ,, .	Oct. 2, ,,	Mar. 24, ,,	173	Off Eden	$10\frac{1}{4}$	$10\frac{3}{10}$	5

* Trawler. † Spirit Preparation. ‡ Label found on Beach. § Label found in Boat.

PLAICE—*continued.*

No.	Place where Liberated.	Date of Liberation.	Date of Recapture.	No. of Days Free.	Place where Recaptured.	Size when set Free.	Size when Re-captured.	Distance Travelled.
						Inches.	Inches.	Miles.
52	Station III., St Andrews Bay	Oct. 2, 1891	Apr. 19, 1893	564	3 miles N. St Andrews . .	$10\frac{1}{2}$	$12\frac{1}{4}$	$4\frac{1}{2}$
53	,, ,, ,, .	,, ,, ,,	Feb. 25, ,,	511	1 mile S. Abertay Bank .	$9\frac{1}{2}$	$10\frac{1}{2}$	4
54	,, ,, ,, .	,, ,, ,,	Apr. 16, 1892	196	Abertay Bank . . .	$10\frac{3}{8}$	$9\frac{2}{5}$	4
55	,, II. ,, .	,, ,, ,,	,, 26, ,,	206	Mouth of Eden . . .	$10\frac{3}{4}$	$10\frac{7}{10}$	$4\frac{1}{2}$
56	,, ,, ,, .	,, ,, ,,	Mar. 29, ,,	178	S. of Abertay Bank . .	11	11	6
57	,, ,, ,, .	,, ,, ,,	,, 23, ,,	172	,, ,, . .	$10\frac{1}{8}$	$9\frac{9}{10}$	5
58	,, ,, ,, .	,, ,, ,,	,, 24, ,,	173	2 miles N. St Andrews . .	$10\frac{3}{8}$	$10\frac{3}{10}$	2
59	,, ,, ,, .	,, ,, ,,	May 3, ,,	211	Mouth of Eden . . .	$9\frac{3}{4}$	...	3
60	,, III. ,, .	Nov. 4, ,,	Mar. 15, ,,	121	Abertay Bank . . .	$10\frac{1}{4}$	$10\frac{8}{10}$	4
61	,, ,, ,, .	,, ,, ,,	Apr. 26, ,,	173	,, ,, .	$9\frac{1}{2}$	$9\frac{1}{2}$	4
62	,, I. ,, .	,, 6, ,,	,, 2, ,,	147	$\frac{1}{2}$ mile S. No. 2 Buoy . .	$10\frac{3}{4}$	$10\frac{3}{4}$	$5\frac{1}{2}$
63	$3\frac{1}{2}$ miles S. Buckhaven .	Feb. 18, 1892	Mar. 22, 1893	398	Largo Bay	12	$11\frac{4}{5}$	$3\frac{1}{2}$
64	2 ,, S. Inchkeith .	Mar. 12, ,,	Apr. 14, ,,	396	2 miles W. Fisherrow . .	$10\frac{3}{4}$	$11\frac{3}{10}$	2
65	Station III., St Andrews Bay	April 15, ,,	Aug. 3, 1892	110	'12–15 E. May' . . .	12	...	22 ?
66	,, ,, ,, .	,, ,, ,,	Apr. 30, ,,	15	Mouth of Eden . . .	$11\frac{1}{2}$	...	$3\frac{1}{2}$
67	,, IV. ,, .	,, ,, ,,	,, 3, 1893	353	,, ,, . . .	$10\frac{5}{8}$	$13\frac{1}{4}$	5
68	,, III., Forth . .	,, 25, ,,	June 9, 1892	45	Off Leith Pier . . .	$11\frac{1}{4}$	$11\frac{1}{4}$	10
69	,, ,, ,, . .	,, ,, ,,	Apr. 14, 1893	354	1 mile off Leith Pier . .	$9\frac{1}{2}$	$9\frac{1}{2}$	9
*70	23 miles E. of May . .	May 26, ,,	Mar. 10, ,,	288	20 miles E.S.E. May . .	$15\frac{1}{2}$	$15\frac{7}{10}$	5
71	Station III., St Andrews Bay	Oct. 8, ,,	Feb. 7, ,,	91	('Dalhousie') . . .	$10\frac{1}{4}$	$10\frac{7}{8}$	...
72	,, ,, ,, .	,, ,, ,,	Mar. 27, ,,	170	Near Abertay Lightship .	$9\frac{1}{2}$	$9\frac{1}{2}$	$4\frac{1}{2}$
73	Near Station III., St Andrews	,, ,, ,,	Apr. 5, ,,	179	,, ,, .	10	10	$2\frac{3}{4}$
74	,, ,, ,,	,, ,, ,,	,, 25, ,,	199	4 miles N. St Andrews . .	$10\frac{3}{8}$	$10\frac{1}{4}$	3
75	Station V., St Andrews Bay .	,, 11, ,,	,, 21, ,,	192	3 ,, ,, . .	$9\frac{3}{4}$	10	6
76	,, ,, ,, .	,, ,, ,,	Feb. 7, ,,	119	(Dalhousie)	$10\frac{7}{8}$	$10\frac{1}{2}$	...
*77	,, ,, ,, .	,, ,, ,,	Oct. 13, 1892	2	'Near Bell Rock' . .	$12\frac{7}{8}$	$12\frac{7}{8}$	5 ?
78	,, ,, ,, .	,, ,, ,,	Mar. 6, 1893	146	1 mile S.S.W. Westhaven .	$10\frac{3}{8}$	?	6

* Trawler.

PLAICE—*continued.*

No.	Place where Liberated.	Date of Liberation.	Date of Recapture.	No. of Days Free.	Place where Recaptured.	Size when set Free.	Size when Re-captured.	Distance Travelled.
						Inches.	Inches.	Miles.
79	Station V., St Andrews Bay	Oct. 11, 1892	Apr. 15, 1893	196	2 miles E. Tents Muir Sands	$9\frac{7}{8}$	$9\frac{3}{4}$	5
80	,, ,, ,,	,, ,, ,,	,, 26, ,,	207	$1\frac{1}{2}$,, E. Mouth of Eden	12	12	6
81	W. of Station II., Forth	,, 22, ,,	Mar. 23, ,,	152	Leven Sands	10	10	7
82	,, ,, ,,	,, ,, ,,	Apr. 1, ,,	161	Kirkcaldy Bay	$11\frac{3}{4}$	...	$1\frac{1}{2}$
83	$2\frac{1}{2}$ miles S. Anstruther	,, 24, ,,	Mar. 25, ,,	152	Pittenweem	$12\frac{1}{4}$	$12\frac{1}{4}$	3
84	,, ,, ,,	,, ,, ,,	,, 22, ,,	149	Largo Bay	$11\frac{3}{4}$	$11\frac{1}{2}$	$9\frac{1}{2}$
85	,, ,, ,,	,, ,, ,,	,, 21, ,,	148	'St Andrews Bay'	$12\frac{3}{4}$	...	...
86	,, ,, ,,	,, ,, ,,	Apr. 6, ,,	164	3 miles off Largo	$13\frac{7}{8}$	$14\frac{1}{2}$	$8\frac{1}{2}$
87	Near Station V., Forth	,, ,, ,,	Mar. 9, ,,	136	300 yards off Leven	$12\frac{1}{8}$	$12\frac{1}{8}$	7
88	Off Gullane Ness	,, 26, ,,	Apr. 14, ,,	170	. . . . . .	$11\frac{3}{8}$	$11\frac{3}{4}$	?
89	Station IV., Forth	,, ,, ,,	,, 3, ,,	159	$\frac{1}{2}$ mile off Leith	11	$11\frac{1}{10}$	3
90	,, ,, ,,	,, ,, ,,	,, 14, ,,	170	2 miles W. Fisherrow	11	$10\frac{1}{2}$	1
91	Station I., St Andrews Bay	Nov. 7, ,,	Mar. 21, ,,	135	$\frac{3}{4}$ mile E. St Andrews	$11\frac{3}{8}$	$11\frac{1}{4}$	...
92	,, ,, ,,	,, ,, ,,	,, 15, ,,	129	1 ,, E. Eden Bar	14	$13\frac{7}{8}$	$1\frac{1}{2}$
93	Near Station V., St Andrews	,, 8, ,,	Apr. 14, ,,	158	Abertay Bank	$11\frac{3}{4}$	$11\frac{3}{4}$	4
94	,, IV., St Andrews	,, 9, ,,	Feb. 11, ,,	95	Tents Muir Sands	13	13	4
95	,, ,, ,,	,, ,, ,,	,, 10, ,,	94	,, ,,	12	12	4
*96	Near No. Carr Lightship	,, 10, ,,	Jan. 19, ,,	71	10 miles E.S.E. Sandy Ness	$11\frac{1}{8}$	$11\frac{1}{8}$	28
97	,, Station I., Forth	,, 12, ,,	Mar. 22, ,,	131	$\frac{1}{4}$ mile off Leith Pier	$13\frac{1}{4}$	$13\frac{1}{2}$	7
98	,, ,, ,,	,, ,, ,,	,, 13, ,,	122	$\frac{1}{2}$,, Kirkcaldy	$14\frac{3}{8}$	...	5
99	Station III., Forth	,, 22, ,,	,, 2, ,,	101	1 ,, Prestonpans	$11\frac{1}{4}$	$11\frac{1}{2}$	$4\frac{1}{2}$
100	,, ,, ,,	,, ,, ,,	,, 4, ,,	103	1 ,, N. Fisherrow	$12\frac{1}{2}$	$12\frac{1}{2}$	$6\frac{1}{2}$
101	,, II., St Andrews Bay	Dec. 6, ,,	,, 9, ,,	93	Mouth of Eden	$10\frac{3}{4}$	$10\frac{3}{4}$	6
102	,, ,, ,,	,, ,, ,,	,, 7, ,,	91	$\frac{1}{4}$ mile off St Andrews	$10\frac{3}{4}$	$10\frac{9}{10}$	5
*103	,, III., ,,	April 15, ,,	June 27, ,,	438	20 miles S.E. by E. of Montrose	$12\frac{1}{2}$	$14\frac{3}{5}$	28

* Trawler.

having travelled 12 miles in 314 and 325 days respectively. A plaice of 11¼ inches, marked and liberated on 25th April 1892, at Station III., Firth of Forth, was re-captured after an interval of 45 days, namely, on 9th June, off Leith Pier, or 10 miles from the place where it was set free. Another, 10 inches long, returned to the water on 25th October 1890, at Station I., St Andrews Bay, was again taken on 8th December following, or 44 days later, at West Ferry, in the Tay, or about 11 miles off. On the other hand, some of the fish were found very near the place where they were liberated, even after a long interval had elapsed. Thus, one 11½ inches in length, was set free at Station IV., St Andrews Bay, on 13th November 1889, and was recovered on 16th April 1891, or 519 days later, in Carnoustie Bay, only 5 miles off. The most remarkable case of this kind was a specimen, 10⅜ inches in length, set free in St Andrews Bay on 14th November 1889, and re-caught only 5 miles away, on 11th February 1892, that is, after the lapse of 819 days. Another, liberated at the same time and place, was recovered 579 days later, only 2 miles off. Others had travelled only 4½ miles in 598 days, 4 miles in 674 days, 2 miles in 587 days, in 245 days, in 396 days, and so on.

I have marked on a chart the lines between the points of liberation and re-capture in each case, and a study of these shows that the immature plaice not merely remain for long periods in the territorial waters, but that both in the Firth of Forth and St Andrews Bay their movement is very largely in a definite direction. Thus, in the Firth of Forth, the immature plaice circulate as it were, along the south shore in a westward direction, and along the north shore in an easterly direction. Without any exceptions, those liberated or re-caught in the southern half of the Firth had moved westwards, while those liberated or re-captured in the northern half had moved, as a general rule, eastwards, and in two cases had passed round Fife Ness into St Andrews Bay. Those set free about the middle line of the Firth moved sometimes to the south-west, and sometimes to the north-east; thus, of four re-captured fish, liberated about 1 mile east of Inchkeith in June 1890, three were obtained to the north-east in Largo and Kirkcaldy Bays, and one to the south-west off Leith. Similarly of two set free at the same time in the middle of the Firth, in deep water, 4 miles east of Inchkeith, one was found off Leith Pier in 131 days, and the other off Kirkcaldy in 122 days after liberation. There are, however, a few cases of marked plaice set free in the north half of the Firth, east of Elie Ness, which have made for the shallow sandy tracts in Largo Bay, moving therefore in a north-west direction; but all these were set free in deep water (28 fathoms) some miles from shore, and there is no evidence of any marked specimens having travelled westwards along the north shore in the shallower water.

An examination of the records referring to the marked plaice in St Andrews Bay reveals a similar definite movement, and with greater distinctness. With a few exceptions, referred to below, all the fish were found at points north or north and slightly west of the place where they were liberated. Those set free in the south part of the Bay were found further north, usually about the sand-banks at the mouth of the River Tay, a few were re-caught in the Tay, and two or three had crossed over the mouth of the Tay to the Bay of Carnoustie, or its neighbourhood. With the exception of five fish, all caught by trawlers—and, therefore, somewhat doubtful in regard to the distance travelled—none of the specimens had moved seawards. The experiments show very clearly that a slow but steady movement of immature plaice occurs northwards along the sandy stretches in the shallow waters of St Andrews Bay, and an examination of the Table indicates that the movement of the fish is relatively slower than in the Firth of Forth.

These experiments concerning the migratory movements of the plaice bring out the following general results :—(1) That plaice tend to remain within the inshore waters during the period of immaturity; (2) That while they may travel 20 miles in about a year or so, their movement is, as a rule, slow ; (3) That in the areas investigated their movement is in a definite direction, namely, inwards along the south shore of the Firth of Forth in a westerly direction, then outwards and eastwards along the northern shore, and that this general direction is continued round St Andrews Bay towards the north. These results are in agreement with other investigations of the 'Garland' into the distribution of immature plaice, and the position of the spawning grounds, and they help to complete our knowledge of the cycle of life and movement of this important flat-fish. The spawning grounds are situated off the mouth of the Forth and St Andrews Bay, the buoyant ova are floated inwards, and the immature fish circulate in the shallower waters in the manner described, passing out to the spawning grounds on approaching maturity : those from the Firth of Forth, apparently chiefly by the channel between the Isle of May and the Coast of Fife, and those from St Andrews Bay, re-inforced to some extent by those from the Firth of Forth, probably moving out from the neighbourhood of the mouth of the Tay in the direction of the Bell Rock.

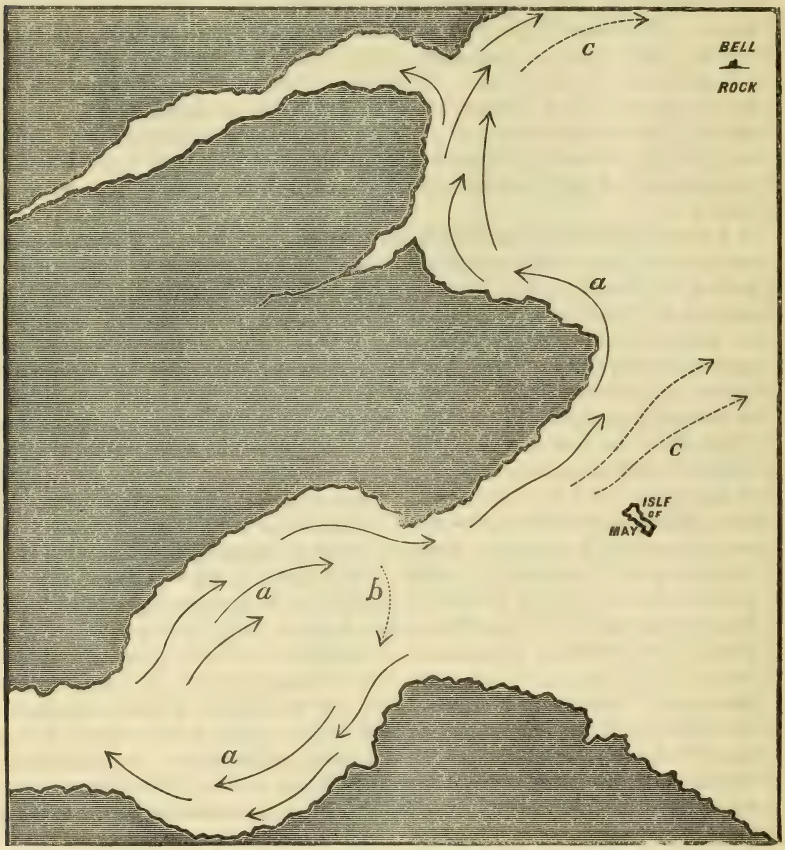

Diagram showing the movement of plaice within St Andrews Bay and the Firth of Forth. *a* indicates the general direction of the movement ; *b* represents a probable movement within the Firth of Forth ; and *c*, the movement offshore to the spawning grounds.

2. Common Dab.

The number of common dabs marked and returned to the sea was 337, of which eleven were re-captured, or 3·2 per cent. If the number which had the label attached by aluminium wire be deducted, the percentage rises to 4·2—small compared with that of the plaice. Particulars regarding each of the specimens which were again caught are given in the adjoining Table. With two exceptions they were all captured by hook; one was caught by beam-trawl, and one in a herring net; and they were all above the minimum size at which sexual maturity is attained. A study of the data referring to these marked dabs brings out a striking contrast in their movements to the movements of the plaice. The distances travelled were greater, ranging from 3 to 37 miles; the average distance was 14·5 miles, in a mean period of freedom of 178·3 days. One specimen set free on 6th November 1891, off the town of St Andrews, travelled round Fife Ness to Kinghorn in the Firth of Forth, a distance of 29 miles, where it was caught on 26th September in the following year, or after an interval of 324 days. Another, liberated near Station I., in the Firth of Forth, on 21st October 1892, was re-captured 2 miles east of Dunbar, 127 days later, on 26th February 1893, having gone a distance of 18 miles. But the most remarkable case is that of the specimen which was set free in St Andrews Bay, 4 miles south of the Abertay Lightship, at the mouth of the Tay, on 8th November 1892, and was re-captured off Burnmouth, on the Coast of Berwickshire, 37 miles distant, on 9th February following, or in 93 days from its liberation. This fish did not come into my possession, but the label was sent to me, and Mr John Doull, the Fishery Officer of the district, made careful inquiries as to the place where it was re-captured by the fishing boat 'Maggie Jane' of Eyemouth.

It will also be observed from the Table that there is no indication whatever of any regularity in the movements of this fish, such as is so characteristic of the plaice. They appear to be erratic. Thus, one passed round from the Firth of Forth into St Andrews Bay, another travelled in the opposite direction from St Andrews Bay to far up the Firth of Forth, and a third, liberated at the same time and place as the one last referred to, went off to the north-east, and was caught three months later off Arbroath. Similarly, of two set free at the same time and place, on 22nd October 1892, one was re-taken 13 miles to the east, further up the Firth of Forth, at Port Edgar, 121 days later, and the other was caught on the Coast of Fife after the lapse of 186 days. It would appear from these experiments that the common dab is much more active than the plaice, that it moves freely about the territorial waters, going considerable distances in comparatively short periods, and travelling indifferently in any direction offshore, or inshore, or along the coast. These results also agree with other investigations of the 'Garland,' which have shown that the young of the common dab have no specially localised habitat, and that the distribution of the spawning fish is indifferently within or without the territorial waters.

3. Lemon Sole.

Only one of 173 marked was recovered. It was 13 inches in length, and was set free on 10th November 1892, near the North Carr Lightship, off Fife Ness, and again caught on 7th March 1893 'in St Andrews Bay.' I learned about it from a fish merchant in Glasgow, to whom it was sent along with other fish. Lemon soles are nearly all caught by trawl, rarely by line, and as it is a fairly vigorous fish it is probable that other marked specimens have been caught, but not forwarded for the reasons previously adverted to.

COMMON DAB.

No.	Place where Liberated.	Date of Liberation.	Date of Re-capture.	No. of Days Free.	Place where Re-captured.	Size when set Free.	Size when Re-captured.	Distance Travelled.
						Inches.	Inches.	Miles.
1	Station I., Forth . . .	May 2, 1889	Nov. 6, 1890	554	Off Methil Dock . . .	$7\frac{1}{2}$	?	6
*2	,, II., St Andrews Bay .	Oct. 25, 1890	Oct. 31, 1891	371		9	9	?
3	,, VI., Forth . . .	June 24, 1891	,, 14, ,,	112	2 miles N.E. Kingsbarns .	$8\frac{1}{2}$	$8\frac{3}{4}$	11
4	,, I., St Andrews Bay .	Nov. 6 ,,	Sept. 26, 1892	324	Near Kinghorn . . .	$8\frac{3}{4}$	$9\frac{1}{4}$	29
5	,, ,, ,, ,, .	,, ,, ,,	Feb. ,, ,,	112	7 miles S.S.E. Arbroath .	$8\frac{3}{4}$	$8\frac{2}{5}$	12
6	Near Station I., Forth . .	Oct. 21, 1892	,, 25, 1893	127	2 miles E. Dunbar . .	$9\frac{1}{2}$	$9\frac{1}{2}$	18
7	,, II., ,, . .	,, 22, ,,	,, 20, ,,	121	Port Edgar	10	...	13
8	,, ,, ,, . .	,, ,, ,,	Apr. 26,, ,	186	4 miles off W. Wemyss . .	$7\frac{3}{4}$	8	3
9	4 Miles S. Abertay Lightship	Nov. 8, ,,	Feb. 9, ,,	93	5 ,, Burnmouth . .	9	?	37
10	Near North Carr Lightship .	,, 10, ,,	,, 4, ,,	86	6 ,, S. Isle of May .	7	$10\frac{9}{10}$	$12\frac{1}{2}$
11	Station III., Forth . .	,, 22, ,,	July 26, ,,	247	6 ,, off Gosford . .	$10\frac{3}{4}$	$10\frac{3}{4}$	4

* Caught by a Trawler.

4. TURBOT AND BRILL.

This fish is rarely got in the 'Garland's' trawl, and only four specimens were marked and returned to the sea. One of these, which was liberated on 10th November 1892, off Fife Ness, near the North Carr Lightship, was re-captured by a trawler 43 days afterwards, on 23rd December, at a point said to be '23 miles S.E. by E. of Montrose,' thus representing a distance travelled of 32 miles. Two brill were marked, but none recovered.

Besides the turbot and brill liberated from the 'Garland,' a large number of young individuals of both species, caught in salmon stake-nets in Montrose and St Cyrus Bays, were marked and set free in the water. It appears the men in charge of the stake-nets are in the habit of setting at liberty the young individuals of those valuable fish accidentally caught in the nets; and by the kindness of Mr James Johnstone, a member of the Fishery Board, 53 young brill, ranging from 5 inches to 11¼ inches in length, and 56 young turbot, ranging in length from 4 to 11 inches, were marked and returned to the sea between May and July 1891. Only one of these, however, appears to have been re-captured, namely, a turbot which was returned to the sea on 27th May, and caught again in the same place on 31st August, when it was found to have grown 2 inches longer (see p. 195).

5. COD.

The number of cod marked and liberated was 196, and of these ten, or 5·1 per cent., were again captured. If the number in which aluminium wire was used be deducted, the percentage of re-captures is increased to 5·4—a pretty fair proportion. Most of the specimens ranged in size between 12 and 16 or 17 inches. The smallest was 7 inches long, and the largest 28 inches; but only 16 of the total exceeded 20 inches in length. The great majority were therefore immature cod—codlings—and they were all re-captured by hook. Considerable difference in regard to the extent of the movement of these fish is indicated in the Table appended, the distance travelled in different cases varying from 1 to 52 miles—the average number of miles being 13·8, and the mean period of freedom 74·7 days. It will be observed that one codling, 17 inches long, travelled only 1 mile in 33 days; another 14¼ inches in length, 4 miles in 104 days; another, 15½ inches long, 1½ miles in 200 days. On the other hand, a codling, 16¾ inches long, travelled 22 miles in 27 days; another, 22 miles in 40 days, and a third, 15¼ inches in length, no less than 52 miles in 69 days. This fish was marked and liberated on 24th November 1892, about 2 miles off Anstruther in the Firth of Forth, and on 1st February 1893 it was caught by a line boat about 2 miles off Dunottar Castle, near Stonehaven, Kincardineshire. Only part of it bearing the label came into my possession; but Mr W. Bain, the Fishery Officer of the district, made careful inquiries as to its capture, and there is no doubt that it was caught at the place mentioned. It would thus appear that codling may remain for an extended period at about the same place in the territorial waters, or they may travel long distances with considerable speed. In the one case in which a fish above the minimum size of maturity was recovered, it had travelled from near Inchkeith, seawards, a distance of over 15 miles; and when captured on 12th February it was found to be a male with the reproductive organs large and approaching maturity. It will be noticed that of two codlings set free on the 18th and 19th February

COD.

No.	Place where Liberated.	Date of Liberation.	Date of Re-capture	No. of Days Free.	Place where Re-captured.	Size when set Free.	Size when Re-captured.	Distance Travelled.
						Inches.	Inches.	Miles.
1	14 miles E. of Inchkeith	Oct. 17, 1889	Nov. 23, 1889	37	2 miles N.N.W. Gullane	19½	?	7
2	Station VI., Forth	Nov. 7, ,,	Dec. 10, ,,	33	1 mile from St Monance	17	?	1
3	,, III., ,,	,, 11, ,,	Feb. 20, 1890	102	3 miles E. of Inchkeith	14¼	14½	4
4	,, VI., ,,	June 24, 1891	Aug. 12, 1891	49	3 ,, off St Monance	13¼	?	1
5	1 mile N. Inchkeith	Feb. 18, 1892	Mar. 17, 1892	27	¾ mile S.E. Isle of May	16¾	16¾	22
6	6½ miles S.E. Isle of May	,, 19, ,,	,, 31, ,,	40	2 miles E. Inchkeith	14½	14⅘	24
7	2½ ,, S. Anstruther	Oct. 24, ,,	May 12, 1893	200	1½ ,, off Pittenweem	15½	18	1½
8	Near Station I., Forth	Nov. 12, ,,	Feb. ,, ,,	92	,, ,, W. Isle of May	25	26	15½
9	,, ,, VI., Forth	,, 24, ,,	,, 1, ,,	69	2 miles off Dunottar Castle	15¼	15¾	52
10	4 miles S.E. by E. May	Dec. 2, ,,	Mar. 10, ,	98	1 mile off St Monance	14	14¼	10

1892, and each re-captured about a month later, one had journeyed from the neighbourhood of Inchkeith, seawards, a distance of 22 miles, while the other had travelled in the opposite direction for about the same distance. The one passing seawards was nearly 17 inches long, a size at which the male sometimes becomes mature; and as its movement took place at the spawning time* it is probable that it was like the nearly ripe male above referred to, on its way to the offshore spawning grounds.

6. THORNBACK RAY.

Of this fish 71 specimens were marked and put back into the sea, and of these two were re-captured. One, $14\frac{5}{8}$ inches in breadth, liberated 14 miles east of Inchkeith on 17th October 1889, was caught by a trawler '6 or 7 miles south-east of the Isle of May' in January 1890, the distance between these points being about 13 miles. The other, 14 inches in breadth, was set free off Gullane Ness on 25th June 1891, and was taken by hook on 30th March 1892, 278 days after liberation, half a mile east of Inchkeith, or 6 miles distant from the place where it was set at liberty.

7. GRAY SKATE.

Twenty-three specimens of gray skate were marked, and one was recovered by a trawler. It was placed in the sea on 8th December 1890, at Station VII., Firth of Forth, and was caught again on the 18th of the same month '7 miles east of the Isle of May,' or 10 miles from the place of liberation. It was $15\frac{1}{2}$ inches in breadth.

8. HERRING.

The importance of ascertaining something definite about the migrations of the herring has been referred to in the Introduction, and at no part of the coast is it of more importance than in the sea area of the Clyde. In the spring of last year (1892), I marked a large number of herrings at Ballantrae Bank. In this case the mark was made by a special instrument, by which a triangular hole was punched in the tail of the fish. It was anticipated that by this method a large number of fish could be rapidly marked, and that since the edges of the aperture made would heal, no injury would be caused to the fish. It was found, however, that unless the hole was made very small the strand of tissue between it and the margin of the fin was apt to break through; and it was further obvious that the mark was not conspicuous enough to catch the eye of those handling large numbers of fish, and that specimens thus marked would probably fail to be detected. The method was therefore abandoned. During the spring of the present year (the herrings frequent Ballantrae Bank only in the spring) arrangements had been made to mark large numbers with a numbered tag, but owing to the failure in the fishing this was not accomplished. At the end of December, as the last batch of herrings were leaving Lochfyne, Mr Scott, with the assistance of Mr Jeffrey, the Fishery Officer of the district, succeeded in ticketing about 600 herrings caught by seine-net in the vicinity of Lochgair, but none of these, or of the fish marked at Ballantrae, have been, so far as known, recovered. These experiments will be conducted on a large scale during the present year.

Vide Tenth Annual Report, Part iii, p. 242.

II.—Rate of Growth.

As has been stated, the abrasion caused by the silk cord interferes materially with the rate of growth of the fish, and a glance at the Tables will show, especially in the case of plaice, how few, comparatively, indicated an increase of growth, and that in most cases only to a very slight degree. All the fish returned were carefully measured by myself; in many cases they had been for a day or two out of the water and had shrunk a little, but experiments on this point made it clear that this shrinkage did not account for much of the decrease in length. Most of the fish, especially the plaice, were thin and poor-looking, but some were fairly plump, and this was especially so with the cod and dabs. In none of the plaice recovered was the reproductive organ much developed, although several were caught at or about the spawning period, and were, *or would have been under normal growth*, of a size at which reproduction, in the male at all events, would have been possible. It is noted below that a plaice of $10\frac{1}{2}$ inches may add (at least) nearly 3 inches to its length in less than a year; and an examination of the Tables show that a number of the marked plaice would have attained 16 and 17 inches had their rate of growth been in similar ratio; that is to say, they would have become sexually mature. Nevertheless, the reproductive organ was small and very immature; and further, these fish remained within the territorial waters. It would appear that interference with growth retards the development of the reproductive organ especially, and that fish thus affected may not pass out to the spawning grounds, although they have reached the reproductive *age*. The stimulus of the movement to the spawning ground appears to spring from the growth of the reproductive organ.

But although the experiments as a whole are not so useful as might have been desired in throwing light upon the rate of growth, some of them furnish important data. In order to provide a basis of comparison, a number of flat fish have been kept by Mr Peter Jamieson in the tanks at Dunbar, and periodically measured and weighed.

I. Plaice.

Eighty-one of the marked plaice recovered were measured by me, and of these 35 had increased in length, the greater number by only a fraction of an inch. The fish which was longest in the water (for 819 days, or 2 years and 3 months) had only grown from $10\frac{3}{8}$ inches to $11\frac{2}{5}$ inches; one which was free for 504 days increased in length from $10\frac{1}{8}$ to $12\frac{4}{5}$ inches; another, after the lapse of 598 days, had increased from $11\frac{3}{4}$ to $14\frac{2}{5}$ inches; a fourth, after 384 days, from $8\frac{5}{8}$ to 10 inches; a fifth, after 354 days, from $8\frac{3}{4}$ to $10\frac{1}{4}$ inches; a sixth, after 587 days, from $9\frac{1}{4}$ to $11\frac{1}{4}$ inches; a seventh, after 564 days, from $10\frac{1}{2}$ to $12\frac{1}{4}$ inches; an eighth, after 511 days, from $9\frac{1}{2}$ to $10\frac{1}{2}$ inches; a ninth, after 164 days, from $13\frac{7}{8}$ to $14\frac{1}{2}$ inches; a tenth, after 438 days, from $12\frac{1}{2}$ to $14\frac{3}{5}$ inches. The one which had increased most in length was $10\frac{5}{8}$ inches when put into the sea, and $13\frac{1}{4}$ when re-captured, 353 days afterwards—an increase therefore of nearly 3 inches in less than a year. From the notes I took at the time in regard to the extent of abrasion, it appears that in this case it was not quite healed. In the third specimen, referred to above, which added about $2\frac{3}{4}$ inches to its length in 598 days, the silk cord was very loose and the abrasion completely healed, the fish being in very good condition. In the sixth specimen the tail was 'badly damaged'; in the seventh specimen the abrasion had healed everywhere, except a small part on the upper surface; in the eighth the abrasion was considerable, but was beginning to heal; in the tenth the abrasion had healed except at one side, and the fish was plump.

Looking at the above facts alone, it might fairly be concluded that a plaice of 10 or 11 inches in length, living in the sea under natural conditions, grows at least 3 or 4 inches longer in the course of a year.

The experiments in the tanks were begun in December 1891, and the following Table shows the variations in length and weight at different periods:—*

Date.	No. 1.				No. 2.				No. 3.				No. 4.			
	Length in inches.	Weight in lbs.	oz.	grs.	Length in inches.	Weight in lbs.	oz.	grs.	Length in inches.	Weight in lbs.	oz.	grs.	Length in inches.	Weight in lbs.	oz.	grs.
1892.																
Jan. 14	18¾	2	15½	0	15¾	1	6½	0	14¼	0	15½	40	13	0	13½	0
,, 28	19		,,		,,	1	6½	60	,,		,,		13⅛	0	13	30
Feb. 11	,,	2	15¼	0	,,	1	6¼	0	,,		,,		13¼	0	13¼	60
,, 25	,,	2	15	0	,,	1	6½	0	,,	0	15	0	,,		,,	
Mar. 10	,,*	2	15½	40	,,	1	7¾	100	,,	0	15	40	,,	0	14½	0
May 5	..		..		16	1	9¾	100	,,	0	14½	0	13½	0	15½	60
June 6	..		..		,,	1	10¾	0	,,	1	0	0	,,	1	0¾	0
July 6	..		..		16⅛	1	12	0	14⅜	1	1½	60	13⅝	1	1	0
Aug. 6	..		..		,,	1	10¾	0	,,	1	1¾	0	,,	1	0½	0
Oct. 6	..		..		,,	1	8½	0	,,	1	0¾	0	,,	1	0¾	0
Nov. 6	..		..		,,	1	8¾	0	,,	1	0	0	,,	1	1	0
Dec. 6	..		..		,,		,,		,,	1	0½	50	,,	1	1¼	0
1893.																
Jan. 6	..		..			1	9	0	,,	1	0½	30	,,	1	0¾	30
Feb. 6	..		..		,,	1	10	0	,,	1	0¾	0	13¾ ‡	1	1½	0
Mar. 6	..		..		,,	1	10¾	0	14½	1	1¾	30	,,	1	1¾	50
April 6	..		..		,,	1	11¾	0	,,	1	2	60	,,	1	2	70
May 6	..		..		,,	1	9¼ †	0	,,	1	2¾	0	,,	1	2¼	0

* This fish (No. 1) was found dead on the 18th of March. It was much distended, and the ovaries, which weighed 164·2 grammes, contained ripe eggs. The temperature of the water in the tanks was 10° C.; that of the sea 9·5° C.

† On 6th April the ovaries were much distended; on 6th May they were partially spent.

‡ On 1st February distension over the ovaries was considerable; on 6th May they were very large.

A number of other plaice were similarly measured and weighed, but the general results only need be given. Thus one was 12⅞ inches long, and weighed 9½ oz. on 3rd December 1891; 13 inches and 11¼ oz. on 25th February 1892; $13\frac{1}{16}$ inches and 13½ oz. on 5th May; 13⅛ inches and 14¼ oz. on 6th September. From this date up to 6th May 1893, its length and weight remained the same. Another, which measured 12 inches and weighed 9¾ oz. on 28th January 1892, a week after being placed in the tank, was 12¾ inches and 13¾ oz. on 6th May 1893; a third, at the same dates, was 12½ inches and 12½ oz., and 12¾ inches and a little over 12¾ oz. respectively. Specimens marked similarly to those in the sea fell off in weight, or only increased by fits and starts. The tanks in which these fish were kept were made of concrete, three feet deep, and containing about 300 gallons; there was an almost constant circulation, and an abundant supply of food. The results are somewhat puzzling; they at all events show, in conjunction with those derived from the migration experiments, what a very important factor confinement may be in interfering with normal growth, and the caution necessary in drawing conclusions from such experiments. Cunningham, who has worked at the subject more extensively than any one else, shows the great variations in the rate of growth of flounders reared in captivity, but he does not appear to have reared plaice.†

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* I am indebted to Mr Peter Jamieson for having measured and weighed the fish on the dates given.

† *Vide* this Naturalist's papers in the *Journal of the Marine Biological Assoc.*, vol. ii., Nos. 2, 3, and 4.

2. Common Dab.

An examination of the Table on p. 188 will show the extent to which the migration experiments throw light on the rate of growth of this fish. Most of them exhibit very slight increase indeed, but one case is remarkable, the second last entered in the Table. It was a female with ill-developed roe (when re-caught), liberated on 10th November 1892, and re-captured on 4th February 1893, having therefore been in the water for 86 days. When placed in the sea it was 7 inches long, and on re-capture it measured $10\frac{9}{10}$ inches—an increase of nearly 4 inches in less than three months. Mr Scott, who measured the fish when it was liberated, has verified the measurement from his original notes, and my note as to its condition when it was sent to me is 'tail very little abraded.' Although the dab, according to Cunningham* may grow to a length of 5½ inches in the first year, the rate of growth in the above case is so exceptionally great, that one may surmise that a mistake has been made. The experiments in the tanks show that the common dab grows more rapidly than the plaice under precisely similar conditions. The following specimens were kept in the same tank as the plaice tabulated on p. 193 :—

Date.	No. 1.				No. 2.				No. 3.				No. 4.			
	Length in inches.	Weight in lbs.	oz.	grs.	Length in inches.	Weight in lbs.	oz.	grs.	Length in inches.	Weight in lbs.	oz.	grs.	Length in inches.	Weight in lbs.	oz.	grs.
1892																
Jan. 14	8⅝	0	4	40	7¼	0	1¾	30	12⅝	0	13½	20	10⅞	0	8	80
Feb. 25	8⅞	0	4½	90	7⅛	0	1¾	20	12¾	0	14½	30	11⅛	0	9¼	50
Mar. 10	9	0	5	0	$7\frac{3}{16}$	0	1¾	90	..	0	14¾	100	..	0	9¼	60
May 5	9½	0	5¾	20	7¼	0	2	30	12⅞	1	0	40	11½	0	10½	0
July 6	9¾	0	6½	90	7½	0	2¼	0	..		..		11¾	0	9½	30
Sept. 6	10⅛	0	7¼	80	8	0	3	70	..		..		12	0	10¾	70
Nov. 7	10⅜	0	8¼	60	8⅝	0	4	0	..		..		12¼	0	12	30
1893																
Jan. 6	10¾	0	9¾	20*	8⅞	0	4½	0	..		..		,,	0	13¼	0
Mar. 6	10⅞	0	10½	0	,,	0	4¼	20	..		..		12½	0	14¼	30
May 6	..	0	10¼	60	9	0	4¼	30	..		.		,,	0	14¼	40

* Ovaries ripening.

It will be observed that the dabs thrived well. No. 1 did not apparently spawn in 1892; but in April and May this year it did. No. 4 spawned in June 1892, and the ovary began to enlarge at the end of December, and it was partially spent in May 1893. No. 2 did not exhibit any distention, and is probably a male; and No. 3 died. These specimens lived in the same tank as the plaice, and were subjected to entirely the same conditions, and yet they grew much more rapidly. No. 1 in the sixteen months increased by nearly 2½ inches in length, and much more than doubled in weight; No. 2 grew nearly 2 inches longer, and also more than doubled in weight; No. 3, in the four months during which it was under observation, added only one quarter of an inch to its length, and nearly 4 oz. to its weight; and No. 4 increased by over 1½ inches in length, and added 6¼ oz. to its weight. Some of the marked specimens in another tank also increased in length and weight, but more slowly. Thus No. 1 (47) was 9¼ inches, 4½ oz. and 60 grains on 14th January 1892, exactly the same on 25th February; the same length, but 20 grains less in weight on 10th March; 9¾ inches in length and 5¾ oz. in weight on 5th May, and thereafter gradually increased to 10⅞ inches and 10¼ oz. on 6th May 1893 (but the label had been removed earlier). Other specimens bring out the same results; details need not be given.

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* *Vide* this Naturalist's papers in the *Journal of the Marine Biological Assoc.*, vol. ii., No. 2, p. 101; No. 4, p. 352; also Mr Williamson's paper on page 265 of the present Report.

I may say that the marked specimen which was captured in a herring net off Dunbar (p. 187), and which exhibited no increase of length during the 127 days it was free, was transferred living to one of the tanks on 25th February. The wound in the tail was rather severe, and the fish did not begin to gain weight until May. On 6th March it was 9½ inches long, and weighed 4½ oz.; on 6th May its length was 9⅝ inches, and its weight 5 oz. and 70 grains.

3. LEMON SOLE.

Only one of the marked and liberated specimens was re-caught (p. 187). It had grown from 13⅛ to 13⅕ inches in the 127 days during which it was free. Two specimens were confined in the tanks. One, living in the tank with the plaice and dabs referred to above, gave the following on the dates mentioned:—14th January 1892, 11½ inches and 10 oz. 30 grains; 11th February, 11½ inches and 9¾ oz. 30 grains; 10th March, 11½ inches and 9¼ oz. and 60 grains; it died later. Another, in a different tank, gave the following results:—14th January 1892, 9¼ inches and 3½ oz.; 11th February, 9¼ inches and 3½ oz. and 60 grains; 10th March, $9\frac{5}{16}$ inches and 3¾ oz. and 40 grains; 6th July, 9⅜ inches and 3¾ oz. 60 grains; 6th September, 9½ inches and 4¼ oz.; 6th October, 9½ inches and 4¼ oz. and 40 grains. It died on 10th October.

4. TURBOT AND BRILL.

The re-captured turbot, which was free for 43 days (p. 189), showed no increase in length; the abrasion was considerable. One of the little specimens set free at Montrose, and re-captured, did, however, show rather rapid growth. It was liberated on 27th May 1891, and was then exactly 6 inches long. On 31st August, or 96 days afterwards, it was taken again at the same place, and was exactly 8 inches in length—an increase of 2 inches in 3 months. In this case the little brass disc was not tied to the tail, but was fixed at the edge of the fish within the marginal fin, the silk cord passing through the flesh, and being tied loosely below. The cord also bore testimony to the rate of growth of the chief food of these young turbot, in the shape of small mussels attached to it, the largest of which measured slightly over ⅕ of an inch in length, but most of them were much smaller.

No marked brill were recovered; but a few specimens brought from Montrose were kept in the tanks. One, placed in the tank on 22nd January 1892, was 14 inches long, and weighed 1 lb. 7¾ oz. on 28th January; on 11th February it was of the same length, but had increased in weight by 1¼ oz. On 24th February it was found dead, and turned out to be a male, with the reproductive organ 'rather mature.' Another specimen, 12½ inches long, and weighing 1 lb. 2½ oz., was put in the tank on 9th February; it was found dead on 17th February, and was a male 'rather mature.' Other two specimens also died in a fortnight; one was a female, 14⅝ inches long, with the ovaries pretty fully developed, and the other a male, 12½ inches long, and rather mature.

5. COD.

Of the ten marked cod re-captured (p. 189), I was able to measure only six. All, except one, exhibited an increase in length, and that one had been only 27 days free. Another, 40 days free, had added nearly $\frac{1}{4}$ inch to its length in that time; the third, caught after a period of 200 days' freedom, had increased in length from 15$\frac{1}{2}$ to 18 inches; the fourth, 92 days after liberation, had increased by 1 inch, from 25 to 26; the fifth increased by $\frac{1}{4}$ inch in 69 days; and the last by $\frac{1}{4}$ inch in 98 days. In all the specimens the abrasion was considerable.

From this circumstance, the vigorous appearance of the fish, and the above measurements, I should conclude that the rate of growth of the cod is exceptionally rapid, and that a medium-sized codling may well add 6 or 7 inches to its length in the course of a year. Cunningham, in discussing Dannevig's results—which, however, referred to a smaller race than the North Sea cod—also expresses the opinion that the growth of the cod is rapid.* I believe it reaches sexual maturity in the third year of its life.

6. WHITING.

Owing to the liability of the whiting to injury in the trawl, comparatively few were in a condition to be marked and returned to the sea. Only sixteen were experimented with, and none of them were recovered. Two whitings were kept in a tank from 8th December 1891 until May and June 1892; they were of the following lengths and weights at the dates mentioned:—The first specimen on 14th January was 8 $_{9}$ inches and 2$\frac{1}{2}$ oz. 60 grains; on 28th January the same length, and 2$\frac{3}{4}$ oz.; on 11th February the same length, and 2$\frac{3}{4}$ oz. 70 grains; on 25th February the same length, and 3 oz. 30 grains; on 10th March the same length, and 3 oz. 60 grains; on 5th May 9 inches and 3$\frac{1}{2}$ oz. It died at the beginning of June. The second specimen was 10$\frac{7}{8}$ inches and 6 oz. 30 grains on 14th January; 10$\frac{7}{8}$ inches and 5$\frac{1}{2}$ oz. 40 grains on 28th January and 11th February; the same length, and 5$\frac{1}{4}$ oz. 20 grains on 25th February; the same length, and 5$\frac{1}{4}$ oz 40 grains on 10th March. It died shortly after this.

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* *Vide* this Naturalist's papers in the *Journal of the Marine Biological Assoc.*, vol. ii., No. 3, p. 224.

II.—ADDITIONS TO THE FAUNA OF THE FIRTH OF FORTH. (Pls. II.–V.)

PART V. By THOMAS SCOTT, F.L.S.

In this—the fifth—contribution towards a better knowledge of the invertebrate fauna of the Firth of Forth, only the lesser crustacea, and chiefly the copepoda, are dealt with. There are several points of interest in the natural history of the Forth crustacea referred to in this contribution: it is shown, for example, that the genus *Longipedia*, which has hitherto been considered to comprise only one species—*Longipedia coronata*—included not only a distinct variety (if it be not a distinct species) of the same genus, but also a supposed sexual form, for which it has been found necessary to provisionally institute a new generic name. Some of the species, though only now recorded for the first time for the Firth of Forth, were collected so long ago as 1889, but were allowed to stand over for want of sufficient information concerning them.

In preparing this paper, I have again the pleasure of thanking the kind friends mentioned in my papers of previous years for assistance and encouragement. I have also gratefully to acknowledge the kindness and sympathy of the following eminent French naturalists who have corresponded with me on matters relating to the subject of these papers:—MM. Le Baron Jules de Guerne and Jules Richard, Dr Raphael Blanchard, Dr Eugene Canu, and Dr Georges Roche. The drawings which accompany this paper are the work of my son, Mr Andrew Scott, who has also prepared the greater part of the necessary dissections. To carefully dissect a copepod, some of which are not more than the thirtieth to the fiftieth of an inch in length, requires no little detexerity; yet a complete series of dissections are often prepared from a single specimen. It is only by such careful work that I have been enabled to add so many rare and interesting species to the number of the Forth crustacea.

Perhaps the following brief statement of the method pursued by my son may be of interest to other students:—When necessary, the specimen is left to soak for a time in caustic potash, but this, while it clears the tissues, has sometimes a tendency to cause the specimen to shrivel up more or less, and not only while it remains in the caustic potash, but also after it is mounted in glycerine jelly—which is the medium generally made use of for mounting. To overcome this difficulty, the specimen, after being removed from the caustic potash, is well washed in fresh-water, which restores it to its normal form. If a full-sized drawing is wanted, and the specimen still shows a tendency to shrink in the glycerine jelly, it is simply mounted in water under a cover-glass till the full-sized drawing is made,—three or perhaps four tiny bits of stout paper being inserted at intervals under the edge of the cover-glass to keep it from pressing on the specimen. The manner in which shrinkage usually takes place is by the contraction of the tissue between each body segment, so that the one segment is more or less drawn in under the other—telescope fashion—and the specimen becomes in this way apparently shorter and more robust than it should be; it is seldom that mounting in glycerine jelly makes any difference on the dissected appendages of the copepoda. When the specimen is to be dissected, it is placed in a little water on a slide on the stage of the microscope—a one-inch objective is the power used—with a fine needle, the thick end of which has been pushed into a small bit of common timber for a handle, and fixed with sealing-wax; the specimen is usually divided into two parts by an incision immediately in front of the first pair of swimming feet. The mouth appendages and antennæ, or the swimming feet, are then first carefully dissected off—each pair by itself—and at once mounted under a separate cover-glass (or bit of cover-glass). A complete series of appendages is sometimes mounted on a single slide—this is done partly for convenience, and partly to save time—and when this is done the series always begins from the same end of the slide, and each appendage or pair of appendages occupies a particular position on the slide; and also, if very small, it is surrounded by a minute ring drawn with common writing-ink. There is thus no confusion, time is made the most of, and comparatively few slides are required.

CRUSTACEA.

COPEPODA.

Family Harpacticidæ.

Genus *Longipedia*, Claus (1863).

Longipedia coronata, Claus.

As there appears to have been some misconception in regard to *Longipedia coronata*, Claus, the following description of what appears to be a typical female, and of two other distinct forms that have probably been accidentally included with it in the same species, may be of interest.

Longipedia coronata, Claus. (Pl. II. figs. 1–13.)
1863. *Longipedia coronata*, Claus, 'Die frei lebenden Copepoden,' p. 110, pl. xiv.
1864. *Longipedia coronata*, Boeck, 'Oversigt Norges Copepoder,' p. 252.
1880. *Longipedia coronata*, Brady, 'Mon. Brit. Copep.,' vol. ii. p. 6, pls. xxxiv.-xxxv. (pars.).
1882. *Longipedia coronata*, Giesbrecht, 'Die frei lebenden Copep. 'der Kieler Föhrde,' p. 99, pls. i., iv.–xii. (? var.).
1892. *Longipedia coronata*, Canu, 'Les Copep. du Boulon.,' p. 146.
1893. *Longipedia coronata*, T. and A. Scott, 'Ann. Scot. Nat. 'Hist.,' vol. ii. pt. 2, p. 91, pl. ii. figs. 4–6.

Length from apex of rostrum to end of caudal stylets (exclusive of setæ) 1·5 mm. ($\frac{1}{16}$th of an inch). Rostrum broad, with a bluntly rounded apex. The form of the animal seen from above is narrow, elongate, and tapering gradually to the end of the abdomen; the whole length is about equal to four times the breadth at the posterior end of the first cephalothoracic segment. Anterior antennæ short, stout, and curved; densely setiferous, most of the setæ being plumose in varying degrees; an elongate sensory filament springs from the third joint, and two similar but short filaments from the extremity of the antennæ. Primary branch of the posterior antennæ, three-jointed. The secondary branch is rather longer than the primary and six-jointed: the joints become longer and narrower towards the apex, so that while the length of the first joint is equal to little more than half the breadth, the last is about one and a half times longer than broad. The posterior antennæ bear numerous plumose setæ. The mandibles have the masticatory portion broad, the truncate end of which is armed both with papilliform and pointed teeth. The two branches of the palp arise from a dilated base; one of the branches is stout and apparently one-jointed; the other is more slender and two-jointed—both branches strongly setiferous. The maxillæ are very similar to those of the *Calanidæ* (fig. 5). Anterior foot-jaws furnished with several marginal setiferous processes; the last process armed with a strong spine in addition to three aculeate setæ; terminal joints small, furnished with a number of slender setæ. Posterior foot-jaws somewhat rudimentary, bearing numerous marginal and delicate plumose setæ. A long delicately plumose hair springs from the lateral aspect and near the base of the foot-jaw, and a few similar hairs from near the middle and distal extremity (fig. 7). The first pair of swimming feet are comparatively short; both branches are of about equal length, and composed of three sub-equal joints. The second joint of the outer branch bears a long, curved, spiniform, and blunt-pointed marginal seta. The last joint is armed with three spiniform marginal setæ, but these are considerably shorter than that on the second joint; both branches otherwise more or less setiferous. The second pair of swimming feet have the inner branches greatly elongated—being equal to about three times the length of the outer branches (the third joint alone is nearly equal to twice the length of the outer branch). The end of the outer branch extends to a little beyond the second joint of the inner one. The long joint of the inner branch is armed on the outer aspect and near the middle—but nearer the proximal than the distal end—with a large aculeate spine, and with two similar but smaller spines on the inner aspect—one near the middle of the joint, but posterior to the large outer spine, and one about one-fourth of the length of the joint from the distal end. This joint is also furnished with three stout and moderately long terminal spines. Both branches of the third and fourth pairs of feet are nearly equal and similar to each other, except that the fourth is a little smaller (figs. 10, 11). Fifth pair small, basal joint scarcely developed, produced exteriorly into an elongate digitiform process, bearing a single apical seta, and furnished interiorly with a very long and curved aculeate seta, the proximal part of which is stout. The secondary branch (or joint) is foliaceous, spathulate in form, the greatest breadth being rather less than half the length; the inner margin nearly straight, bearing several minute teeth; outer margin and end sinuate and provided with a number of setæ, the innermost being nearly three times the length of the joint from which it springs (fig. 12). The postero-lateral angles of the first abdominal segment are produced into tooth-like processes. The postero-lateral angles of all the thoracic and abdominal segments are acutely angular—the last abdominal segment is very short—with the dorsal part of the posterior margin spiniferous, the central spine being large and prominent, the others small. Caudal stylets short; the longest of the caudal setæ are scarcely equal to twice the length of the abdomen and caudal stylets combined. One ovisac.

No males of this form have yet been observed in the Firth of Forth, but females are frequent.

This appears to be the form described in the monograph of the British Copepoda as the 'male' of *Longipedia coronata.* It also closely agrees with the description and figures of Claus, both as regards its size and structural details, with the exception of the arrangement of the spines on the long joint of the inner branches of the second pair of swimming feet. Claus's figure agrees with that of Giesbrecht in this respect. But the form now described does not agree with that described by Giesbrecht in size, in the form of the second and fifth pairs of thoracic feet, and in some other important points. That described by Giesbrecht, on the other hand, agrees perfectly with a form recently discovered by my son, Andrew Scott, while examining some dredged material from the Firth of Forth, and which is provisionally described as *Longipedia coronata,* var. *minor.* The following is a description of this variety:—

Longipedia coronata, var. *minor*, T. and A. Scott. (Pl. II. figs. 14–20.)
1893. *Longipedia coronata*, var. *minor*, T. and A. Scott, 'Ann. Scot. Nat. Hist.,' vol. ii. pt. 2, p. 93.
1882. (?) *Longipedia coronata*, Giesbrecht, *loc. cit.*

Length from apex of rostrum to end of caudal stylets, exclusive of tail setæ, ·82 mm. (one-thirtieth of an inch). Female—anterior and posterior antennæ and mouth organs similar to those of *Longipedia coronata*, but smaller. Male—anterior antennæ short and robust, much less setiferous than those of the female, hinged between the third and fourth joints, terminal joint forming a comparatively small and curved claw-like appendage (fig. 15). First pair of swimming feet somewhat similar to those of *Longipedia coronata*, but smaller. The second pair in the female differ from those of *Longipedia coronata* in the following particulars:—The outer branch is considerably longer in proportion to the inner branch, the end of the second joint in the one reaching to about the end of the second joint in the other; and the long third joint of the inner branches is only about one and a half times the length of the outer branches; and the spine on the outer aspect of the long third joint is situated between the two spines on the inner aspect, but nearer to the proximal one (fig. 16). The exterior spine on the long third joint is wanting in the male; the outer branch of the second pair of the male is also somewhat proportionally shorter than in the female (fig. 17). The other swimming feet are nearly similar to those of *Longipedia coronata*, but are rather smaller. The fifth pair in the female differ considerably from those of *Longipedia coronata* in the form of the secondary branch (or joint). This branch is elongate and narrow (fig. 18), the greatest breadth being only equal to about one-fourth of the length; and also, though the var. *minor* is little more than half the length of the (supposed) typical form, the length of the secondary branch of its fifth foot is greater than that of the other. This difference may be indicated in another way—*i.e.*, in *Longipedia coronata* the length of the secondary branch of the fifth foot is scarcely equal to one-fourteenth of the entire length of the animal, but in *Longipedia coronata*, var. *minor*, the length of the secondary branch is equal to one-eighth of the length of the animal. In the male the fifth pair are small, and the basal joint is proportionally rather more developed than in the female; the secondary branch is rather broader and shorter; and the interior spiniform basal seta is straight, and considerably shorter than in the female (fig. 20). The appendages of the first abdominal segment in the male are nearly as large as the basal part of the fifth feet, and are furnished with three setæ. The central one of the three marginal spines of the last abdominal segment is not so large proportionally, and the apical setæ of the caudal stylets are much longer than in *Longipedia coronata* (fig. 19). One ovisac. Frequent in dredged material from Largo Bay and off Musselburgh. This is certainly not the form described as *Longipedia coronata* (male) in the monograph of the British Copepoda; neither does it appear to agree with that described by Claus, except in the arrangement of the spines on the last elongate joint of the inner branch of the second pair of swimming feet, but it agrees in size and in structural details with that described by Giesbrecht in his account of the free living Copepoda of Kiel fiord.

Genus *Canuella*, T. and A. Scott.

'Ann. Scot. Nat. Hist.,' 1893.
Longipedia, Brady (in part).

Somewhat like *Longipedia coronata*, Claus; but the inner branches of the second pair of swimming feet are not longer than the outer branches.

Fifth pair of feet in both sexes rudimentary; last abdominal segment not spiniferous; ovisacs two.

Canuella perplexa, T. and A. Scott. (Pl. II. figs. 21–35.)
1893. *Canuella perplexa*, T. and A. Scott, 'Ann. Scot. Nat. Hist.,' vol. ii. p. 92, pl. ii. figs. 1–3.
1880. *Longipedia coronata*, Brady (in part), 'Mon. Brit. Copep.,' vol. ii. p. 6, pl. xxxiv. figs. 3, 9; pl. xxxv. figs. 1, 3, 9.
1867. (?) *Sunaristes paguri*, Hesse, 'Ann. des Sci. Nat.,' 5th ser. (Zool.), vol. vii. p. 205, pl. .
1884. (?) *Longipedia paguri*, W. Müller, 'Archiv. für Naturg.,' Jahrgang 50, 1st Band, p. 19, pl. 13.

Length (exclusive of caudal setæ) 1·4 mm. ($\frac{1}{18}$th of an inch). Body seen from above elongate, nearly cylindrical, tapering slightly to the posterior end; forehead produced into a stout and somewhat conical rostrum. Anterior antennæ of the female stout, especially the basal portion, curved, and indistinctly five-jointed, furnished with numerous elongate setæ, most of which are plumose; two sensory filaments spring from the third joint. In the male the middle joints of the anterior antennæ are narrower than the preceding joints, or than the one immediately following. This joint, which is the penultimate one, is dilated, while the last is small and hook-like—the two forming together an efficient grasping organ. Primary branch of posterior antennæ three-jointed, the middle joint short; secondary branch rather stouter than the other and six-jointed, tapering slightly towards the posterior end; the third joint is somewhat longer than the other five; the breadth of the first joint is equal to about three times the length, and of the last to about twice the length (fig. 23). Mouth organs nearly as in *Longipedia coronata*. First pair of swimming feet also similar to those of *Longipedia coronata*, but shorter, more robust, and armed with stouter spines and longer plumose setæ. The outer margin of the first joint of the outer branch bears a pectinate fringe of spine-like setæ immediately anterior to the large spine, and the outer margins of the second and third joints of the inner branch are similarly fringed. Both branches of the second pair of swimming feet are of about equal length. First joint of the inner branch very short, and armed on the lateral aspect with a stout conical and tooth-like process, which reaches slightly beyond the end of the next joint; the third joint in both branches is rather longer than the combined length of the other two (fig. 28). The third and fourth pairs are somewhat similar to those of *Longipedia coronata*. Fifth pair in both sexes rudimentary, and consisting of a very small basal joint bearing four setæ; the second seta from the inside is longer than the others and plumose. Caudal stylets strongly divergent; length equal to rather more than twice the breadth; caudal setæ comparatively short, scarcely equal to three-fifths the length of the animal. Ovisacs broadly ovate; their transverse diameter about three-fifths of the length.

This species is of frequent occurrence, especially in material dredged off Musselburgh and in Largo Bay, but specimens with ovisacs are scarce.

Canuella perplexa appears to be the form described in the monograph of the British Copepoda as the female of *Longipedia coronata*.

In 1867 Hesse described* a copepod he had discovered living in the same shell with a *Pagurus*, and to which he gave the name of *Sunaristes paguri*. This copepod resembles *Canuella perplexa* in some respects, but the difference in habitat, the difference in size (Hesse states, *loc. cit.*, that *Sunaristes* is 5 mm. long, but this probably includes the tail setæ), and the difference in important structural details is so great that it seems

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* *Ann. des Sc. Nat.*, 5th ser. (Zoology), vol. vii. p. 205.

scarcely possible they can be the same species. In *Sunaristes* the genital segment of the female abdomen is equal to the entire length of the other abdominal segments, the ovisacs are elongate ovate, somewhat pointed at both ends, and reach to the end of the abdomen ; the buccal appendages and swimming feet also differ. Further, when describing the *habitat* of *Sunaristes* he says, *loc. cit.*, 'Sont les compagnons intimes des Pagures, et 'c'est avec la plus grande peine qu'on peut les en sépârer, non qu'ils 'soient fixés sur eux comme le sont leurs parasites, mais par leur adresse 'á ce cacher dans l'intérieure on en dessous des coquilles que ceuxci 'habitent.' But *Canuella* is free-living like *Longipedia*. Specimens both of *Paguri* and their shells have been examined without obtaining a single specimen of *Canuella ;* all our specimens have been obtained in dredged material, or with hand-net, along with *Longipedia* and other free-living species. In 1884 Dr Wilhelm Müller described * a large copepod he also had obtained living as a messmate with a species of *Paguri* [*Pagurus* (*Eupagurus*) *bernhardus*], and which he named *Longipedina paguri*. This may be the same species as that described by Hesse as *Sunaristes paguri*, but if so the description and figures of the one certainly differ very widely from those of the other.

Longipedina paguri, W. Müller, has even a closer resemblance to *Canuella* than *Sunaristes* has, but there are still important differences—*Longipedina* is twice the size of *Canuella*, its length, exclusive of tail setæ, being, as stated by Müller, 2·7 mm. It is a messmate with *Pagurus bernhardus*, while *Canuella* is free-living. The second pair of swimming feet in the male are different from those of the female, but in *Canuella* they are alike in both sexes.

'After a careful study of the descriptions and figures of *Sunaristes* and '*Longipedina*, we find that' . . . . . 'the difference, both in respect 'of structure and *habitat*, between each of these and the species described 'by us, is apparently so great that we prefer for the present to consider 'the Forth species as distinct.' †

Zosime, Boeck (1872).

Zosime typica, Boeck. (Pl. V. figs. 14–17.)
1872. *Zosime typica*, Boeck, 'Nye Slægter og Arter af Saltvands-'Copepodar,' p. 14.
1880. *Zosime typica*, Brady, 'Mon. Brit. Cop.,' vol. ii. p. 15, pl. xxxix. figs. 1–12.

Habitat.—In material dredged off Musselburgh, frequent. The Forth specimens of this interesting and well-marked species agree thoroughly in structural details with the description and figures in 'British Copepoda.' The structure and armature of the first pair of swimming feet and of the female fifth pair are characters by which the species is readily distinguished.

Genus *Jonesiella*, Brady (1880).

Jonesiella hyænæ, I. C. Thompson. (Pl. III. figs. 1–6).
1889. *Jonesiella hyænæ*, I. C. Thompson, 'Proc. Biol. Soc. 'Liverpool,' vol. viii. p. 193, pl. ix. figs. 1–10.

This rather peculiar and interesting species was obtained among dredged material collected near Eyebrough Rock—a short distance west of Fidra

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* *Archiv für Naturg.*, *jahrgang* 50, 1st Band, p. 19.

† *Ann. Scot. Nat. Hist.* (April 1893), p. 94.

Lighthouse, Firth of Forth, during February this year. A number of specimens were obtained. The anterior antennæ are six-jointed, short, stout, and furnished with several strongly plumose setæ; the first joint is large and robust, the second, third, and fifth are short, while the fourth and the last joints are very small. The basal joint projects almost straightforward from the head, the remaining joints curve outwards so that the last three are nearly at right angles to the basal joint; two stout spines, setiferous on the upper margin, spring from the upper part of the distal end of the third joint, and an elongate sensory filament and a very long slender and plain seta from the upper distal angle of the same joint; the fifth joint is also furnished with a stout terminal spine similar to those on the end of the third joint (fig. 2). Rostrum prominent, moderately broad; extremity rounded, and extending beyond the geniculate anterior antennæ. Secondary branch of the posterior antennæ well developed, reaching beyond the end of the primary branch; three-jointed, middle joint very small (fig. 3). Mandible palp distinctly two-branched, one branch long and narrow, the other short, and each furnished with several apical setæ. Foot-jaws and swimming feet as described and figured by Mr Thompson. Fifth pair large, foliaceous; internal portion of the basal joint well developed, sub-triangular; apex broadly rounded; exterior portion of basal joint forming a small rounded process at the base of the secondary joint; secondary joint broadly ovate, scarcely reaching to the apex of the inner portion of the basal joint; lateral margins of both joints ciliate, distal margins furnished with several 'spear-shaped' setæ (fig. 6).

Jonesiella hyænæ differs from other British species of *Jonesiella* by having the inner branches of the first pair of swimming feet three-jointed, and also by the secondary branch of the posterior antennæ being three-jointed:* these differences may render it necessary to modify the generic description, or to remove *Jonesiella hyænæ* to another genus. There can be no doubt, however, that the general structure of this species agrees fairly well with the more typical members of the genus in which it is placed.

Genus *Delavalia*, Brady (1868).

Delavalia palustris, Brady.

1868. *Delavalia palustris*, Brady, Nat. Hist. Trans. Northumb. 'and Durham,' vol. iii. p. 134, pl. v. figs. 10–15.
1880. *Delavalia palustris*, *idem*, 'Mon. Brit. Copep.,' vol. ii. p. 43, pl. l. figs. 1–8.

Habitat.—Estuary of the Forth, in the vicinity of Culross, rather scarce. Common in brackish water pools at the mouth of the Peffer Burn, Aberlady Bay, ♀ with ovisacs. *Delavalia palustris* appears to be restricted to localities where the water is more or less brackish. In the monograph of the 'British Copepoda' it is recorded from only one locality—the mouth of the Seaton Burn, Northumberland.

It may be of interest to enumerate some of the Copepoda that have been found associated together in the upper reaches of the Forth estuary, as *Eurytemora affinis*, Poppe; *Tachidius crassicornis*, Scott; *Delavalia palustris*, Brady; *Thalestris harpactoides*, Claus; *Platychelipus littoralis*, Brady; *Hersiliodes littoralis* (Scott); *Acartia longiremis*, Lilljeborg; *Temora longicornis*, Müller, &c. A few of these, as *Eurytemora affinis*, *Tachidius crassicornis*, *Delavalia palustris*, and *Hersiliodes littoralis*, have not been observed in the Forth beyond the area referred to, while others are not so restricted, and have been obtained in different localities—seaward as well as inshore.

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* We have recently ascertained that *Jonesiella spinulosa* has the secondary branch, also three-jointed, the intermediate joint being very small.

Delavalia æmula,* sp. n. (provisional name). (Pl. IV. figs. 36–47.)

Length, ·73 mm. Similar in form to *Delavalia reflexa*, Brady and Robertson. Anterior antennæ of the female nearly as in *Delavalia robusta*, Brady and Robertson; male anterior antennæ nine-jointed, hinged between the sixth and seventh joints; a sensory filament springs from the end of the fourth joint in both sexes, but that of the female is shorter. The formula shows approximately the relative length of the joints of the antennæ in both male and female :—

$$\begin{array}{ll} \text{Female antennæ, .} & 20\cdot10\cdot8\cdot\ 6\cdot4\cdot\ 8\cdot6\cdot4\cdot \\ \hline & 1\cdot\ 2\cdot3\cdot\ 4\cdot5\cdot\ 6\cdot7\cdot8\cdot9\cdot \\ \hline \text{Male antennæ, .} & 24\cdot11\cdot5\cdot13\cdot5\cdot10\cdot8\cdot5\cdot7\cdot \end{array}$$

Secondary branch of posterior antennæ three-jointed, middle joint very small. Basal joint of mandible palp—elongate—about three times longer than broad; the branches, which are subequal, are less than half the length of the basal joint. Posterior foot-jaws nearly as in *Delavalia robusta*, the last joint short, narrow, and curved, and appearing to be merely a continuation of the base of the terminal claw (fig. 41). Both branches of all the four pairs of swimming feet—except the inner branches of the second pair in the male—three-jointed; the inner branches of the first pair are rather longer than the outer, and the first joint is about one and a half times longer than the next one (fig. 42). The second joint of the inner branch of the second pair in the male is nearly twice the length of the first joint, and probably consists of two coalesced joints, rather slender, and with the inner margin of the proximal half strong, gibbous, and furnished with a plain, flexuous, terminal seta fig. 43). Fifth pair in both sexes nearly as in *Delavalia reflexa*, except that the basal joint carries one very small and four elongate stout plumose setæ, and the outer joint six plain setæ. Caudal stylets about equal in length to the last abdominal segment. The inner of the two principal caudal setæ very long, equal to the combined length of the abdomen and caudal stylets.

Habitat.—Largo Bay. Not rare.

Delavalia æmula differs especially in the inner branches of the first pair of swimming feet being three-jointed, and seems otherwise to combine characters belonging to all the other three British genera.

Genus *Cletodes*, Brady (1872).

(?) *Cletodes tenuiremis*, sp. n. (provisional name). (Pl. III. figs. 21–28.)

Animal resembling *Cletodes linearis* (Claus). Length, ·96 mm. Anterior antennæ seven-jointed, basal points robust; all the joints, with the exception of the first, subequal in length. The approximate length of the joints are shown by the formula—

$$\frac{14\cdot8\cdot7\cdot7\cdot5\cdot5\cdot6\cdot}{1\cdot2\cdot3\cdot4\cdot5\cdot6\cdot7\cdot}$$

Secondary branch of posterior antennæ small, uniarticulate, and bearing two short terminal setæ. Mandible palp consisting of a small one-jointed branch (fig. 24). The first pair of swimming feet have the inner branches

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* *Æmulus*, an imitator.

short, two-jointed, the outer three-jointed branches also short, but rather longer than the inner branches; exterior marginal spines of the outer branches elongate, slender; inner and outer branches provided with very long, slender, and blunt-pointed terminal filaments (fig. 25). Inner branches of second, third, and fourth pairs very short, one-jointed; the intermediate terminal seta of both branches of the second and third pairs very long and sparingly plumose (fig. 26). Intermediate terminal seta of the inner branches of fourth pair not reaching much beyond the end of the outer branches. Fifth pair very small, almost rudimentary; basal joint furnished with four subequal plain setæ, and the secondary joint with five setæ of unequal length (fig. 28). Caudal stylets short, their breadth equal to about two-thirds the length; primary caudal seta equal to the combined length of the last abdominal segment and stylets, the other setæ minute. The last four abdominal segments are adorned with three to four transverse rows of minute cilia, and the posterior margins of thoracic and abdominal segments are fringed with aculeate setæ, as shown in figure .

Habitat.—Vicinity of Inchkeith. February 1893. Dredged; rare.

This species, which is doubtfully referred to *Cletodes*, differs from that genus in having the inner branches of all but the first pair of the swimming feet one-jointed, but as it agrees with *Cletodes* in most of the other important characters, and as no male has yet been obtained the structure of which might have assisted in more satisfactorily indicating the affinities of the species, it seems better in the meantime to place it in the genus *Cletodes*. One peculiar character of the species that distinguishes it from almost all others of the genus to which it is referred, is the long terminal filaments of the first pair of feet; they do not appear to be hairs or setæ in the proper sense, but have rather the appearance of filamentous conferva. There can be no doubt, however, that they are organically connected with the first feet, and are not accidental parasitic growths.

Genus, *Platychelipus*, Brady (1880).

Platychelipus littoralis, Brady. (Pl. V. figs. 11–13.)

1880. *Platychelipus littoralis*, Brady, 'Mon. Brit. Copep.,' vol. ii. p. 103, pl. lxxix. figs. 20–23; pl. lxxx. figs. 15–19.

Habitat.—Forth estuary, near Culross, and also off Musselburgh. This well marked species was of frequent occurrence in the material collected off Musselburgh. The long, curved, claw-like, and spiniform terminal seta of the inner branches of the first pair of swimming feet (fig. 12), together with the *Enhydrosoma*-like form of the animal, enable the species to be distinguished almost at first sight. *Platychelipus* is well described and figured by Dr Brady in the 'Monograph of the British 'Copepoda.' I do not know of any previous record of it from the Scotch coasts.

Genus, *Dactylopus*, Claus (1863).

Dactylopus rostratus, sp. n. (provisional name). (Pl. III. figs. 7–20.)

This copepod, for which I propose the provisional name *Dactylopus rostratus*, closely resembles *Dactylopus flavus*, Claus, in some structural details, and may be a large variety of that species. (*Dactylopus rostratus* is 1 mm. in length, whereas *Dactylopus flavus* is little more than half that size.) But besides being nearly double the size of *Dactylopus flavus*, it is readily distinguished from that species by the prominent and bluntly-rounded rostrum, which, like *Delavalia palustris*, is provided with two minute lateral setæ. The anterior antennæ are short and seven-jointed (fig. 8). The formula shows the relative length of the joints :—

$$\frac{10 \cdot 12 \cdot 10 \cdot 10 \cdot 8 \cdot 5 \cdot 7 \cdot}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot}$$

The inner branch of the posterior antennæ is two-jointed (fig. 10). The mandibles are well developed; apex of biting part broad, truncate, and armed with a row of stout blunt-pointed teeth, and a marginal divergent seta; there is also a stout tooth, larger than the others, arising from the lateral distal aspect of the mandible. Posterior foot-jaws stout, with a long slender terminal claw; the inner margin of the second joint has an intermediate fringe of cilia, and two small setæ near the distal end; a prominent setose spine springs from the inner distal angle of the first joint, and immediately behind the seta is a transverse row of small hairs. The first pair of swimming feet, which somewhat resemble those of *Dactylopus flavus*, differ in the spines on the exterior distal angles of the first and second joints of the outer branches being not larger than the marginal spine of the third joint, and in the apical setæ of the third joint being non-geniculate; the outer margins of all the three joints are strongly setiferous; the inner branch, which has also the outer margin of all the joints fringed with small setæ, is armed with a stout, moderately long, and straight terminal spine and two setæ (fig. 14). The inner branches of the second pair in the male terminate in a stout, slightly curved, conical spine as long as the third joint (fig. 15). The fourth pair resemble those of *Dactylopus flavus*, but the outer margins of both branches are setiferous, and the elongate setæ on the inner margins are plumose (fig. 16). The inner segment of the basal joint of the fifth pair is slightly produced and rounded, and provided with four marginal setæ, one being greatly elongate; the secondary joint is short, obliquely truncate at the end, and furnished with four unequal terminal setæ; fifth pair in the male smaller, the inner portion of the basal joint less produced, and armed with two spine-like setæ of unequal length, the longer one being plumose (fig. 18). Abdominal segments strongly ciliate. Caudal stylets short and stout; the inner one of the two caudal setæ much longer than the other, and equal to half the length of the entire animal. Spermatophore broadly ovate (fig. 20).

Several specimens of this species were obtained by washing some shells inhabited by *Pagurus bernhardus*, and collected west of Inchkeith. The copepods may only have been accidentally harbouring about the shells; they have scarcely the appearance of 'commensals' or 'messmates.'

Family SAPHIRINIDÆ, Thorell.

Genus *Lichomolgus.*

Lichomolgus hirsutipes, sp. n. (provisional name). (Pl. IV. figs. 1–12.)

Length 1·4 mm. ($\frac{1}{18}$th of an inch). Seen from above, the first four segments of the cephalo-thorax are together broadly ovate, the first segment has a shield-like form, the fifth segment is narrow, and the proximal rather narrower than the distal end. Anterior antennæ seven-jointed. The relative length of the joints is shown by the formula—

$$\frac{19 \cdot 44 \cdot 8 \cdot 19 \cdot 20 \cdot 15 \cdot 11 \cdot}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot}$$

Posterior antennæ four-jointed, third joint short, last joint bearing two stout and hooked terminal claws. Mandibles nearly as in *Licho-*

molgus poucheti, Canu; the broad anterior margin of the basal portion is distinctly furrowed, the furrows extend to the edge, and give to it a crenate appearance (fig. 4), maxilla (*a*) with three terminal setæ. The moderately long slender extremity of the anterior foot-jaws is strongly pectinate on the upper edge, but plumose towards the end; a stout and strongly plumose seta, equal to about a third of the length of the slender terminal part of the foot-jaw, springs from the inner edge of the base, where there is also a small seta on the lateral aspect. Posterior foot-jaws of the female three-jointed; the first and second joints, which are subequal in length, are of moderate size, but the last joint is small; two setæ spring from near the middle of the second joint; the third joint, besides being furnished with a stout terminal seta, is armed at the apex with a robust conical spine, somewhat longer than the joint to which it is articulated (fig. 6). The posterior foot-jaw in the male is armed with a long, curved, terminal claw, fully twice the length of the joint from which it springs (fig. 7). In the female the fifth pair of feet are elongate; they reach to nearly the end of the genital segment of the abdomen; the whole of the upper portion of each foot is clothed with short aculeate setæ; the fifth pair in the male are much shorter, and without setæ. Female abdomen slender, and composed of five segments. Genital segment comparatively small, but fully twice the length of the next; breadth about equal to the length; the remaining four segments are nearly equal to each other in length. Caudal stylets fully one and a half times longer than the last abdominal segment, and provided with one subterminal and four apical setæ; the second seta from the inside is considerably longer than the others, being equal to the entire length of the abdomen. Genital segment of the male abdomen large, subquadrate, the sides slightly convex, the distal end truncate, and bearing two small setæ on each side of the following segment; the length of the genital segment is about equal to that of the other four segments and the caudal stylets combined. The caudal stylets of the male are somewhat shorter than those of the female (fig. 12).

The fifth pair of feet in the female of this species form a well-marked and distinctive character.

Habitat.—'Rath Ground,' a short distance north of the Bass Rock, Firth of Forth.

Genus *Modiolicola*, Aurivillius.

Modiolicola insignis, Aurivillius. (Pl. IV. figs. 13–24.)

1883. *Modiolicola insignis*, Aurivillius, 'Akademisk Afhandling,' Stockholm (1883), p. 10, t. ii., figs. 1–10; t. iv., figs. 1–8.

1885. *Lichomolgus insignis*, Raffaele é Monticelli, 'Mem. d. R. 'Accad. d. Lincei,' ser. 4, vol. i. p. 302, figs. 13–16.

1892. *Modiolicola insignis*, Canu, 'Les Copep. du Boulon.,' p. 238, pl. xxiv. figs. 14–20.

Length 1·2 mm. ($\frac{1}{20}$th of an inch). Cephalo-thorax broadly ovate; abdomen elongate, narrow, and equal to about two-thirds the length of the cephalo-thorax. First cephalo-thoracic segment subtriangular, and equal to the combined length of the other four thoracic and first abdominal segments. Forehead narrowly rounded. Anterior antennæ short, scarcely half the length of the first bony segment, seven-jointed, the second joint much longer than any of the others. The subjoined formula exhibits the relative length of the joints:—

$$\frac{8\cdot17\cdot4\cdot8\cdot10\cdot7\cdot4\cdot}{1\cdot2\cdot3\cdot4\cdot5\cdot6\cdot7\cdot}$$

Posterior antennæ four-jointed, joints subequal in length, but the last two are more slender than the first and second; the apex is furnished with three claw-like and hooked spines, and also a seta of about the same length as the spines. Mandibles nearly as in *Lichomolgus forficula*, Thorell. Basal part of the anterior foot-jaws stout, terminal part extremely long and slender, gradually tapering to a setiform extremity, and bent at nearly right angles to the basal part; the upper edge of the terminal part is furnished with a fringe of cilia which extend from the geniculation, where they are stout and setiform, but rapidly decrease in size towards the extremity. Posterior footjaws in the female rudimentary, three-jointed, the last very small, and without any spines or setæ; the posterior foot-jaws in the male form powerful grasping organs, composed of two stout joints, and a very long falciform terminal claw, which carries a small seta at its base; the second joint has the distal half of the inner edge fringed with cilia (fig. 19). Both branches of the first four pairs of swimming feet three-jointed, and of nearly equal length; the first basal joint of the first pair is furnished interiorly with an elongate and stout plumose seta, the inner margins of both branches are also provided with long plumose setæ; the armature of the inner branch comprises one seta on the distal end of the inner margin of the first joint, two on the second, and two on the third joint; there are also four short dagger-shaped spines round the end of the third joint, and the outer distal angles of the first and second joints form tooth-like processes; there is no seta on the inner edge of the first joint of the outer branch, one on the second and five on the third joint; the third joint is also armed on the outer margin and end with four dagger-shaped spines—the terminal one being the largest; the second also bears one dagger-shaped spine on the outer distal angle, and the first joint one. The armature of the fourth pair differs from that of the first in the following manner—there is no seta on the interior edge of the second basal joint, the first and second joints of the inner branch bear each a long plumose seta on the distal end of the inner margin, there is no seta on the third joint; this joint is truncate at the end, and armed with two stout dagger-shaped terminal spines; the outer distal angle of the second joint forms a bifid toothed process, and there is a small tooth on distal end of the outer margin of the first joint; the second joint of the outer branch bears one long seta on the inner margin, and the third joint five seta; the third joint is also armed at the extremity with a long sabre-like spine, ciliate along the inner edge, and with two short dagger-like spines on the outer margin; and the first and second joints are each provided with a similar spine on the outer distal angle (fig. 21). The fifth pair are small and one-jointed, the apex truncate, and furnished with one long, stout, and slightly curved spine, and a small spiniform seta, both of which are plain (fig. 22), fifth pair alike in both sexes. First abdominal segment in both sexes considerably dilated; that of the female has the sides rounded, is widest across the middle, and furnished on each side, on the ventral aspect, with a small setiferous appendage; that of the male is widest across the distal end, the distal angles are somewhat produced, and provided with three small setæ. The second, third, and fourth abdominal segments have the posterior margins in both sexes strongly setose. Caudal stylets about equal to twice the length of the last abdominal segment, and furnished with a small seta on the proximal half of the outer margin, and with four apical setæ; the male abdomen is rather smaller than that of the female. Ovisacs two, large. Colour of the animal, including ovisacs, usually brilliant red.

Habitat.—Living as a messmate within the shell of the 'horse mussel,' *Mytilus modiolus.* Frequent in the Firth of Forth. I have also obtained *Modiolicola* in *Mytilus modiolus*, both in the Moray Firth, on the East

Coast, and in the vicinity of Mull on the West Coast. It frequents the branchial lamellæ of the mollusc. A considerable number of specimens may sometimes be obtained in a single mussel, while in others it may be rare or altogether absent.

Family Artotrogidæ, Brady.

Genus *Cyclopicera*, Brady.

Cyclopicera purpurocincta, sp. n. (provisional name). (Pl. III. figs. 29–40.)

Length, exclusive of caudal seta, 1 mm. ($\frac{1}{25}$th of an inch). Seen from above, the cephalo-thorax is broadly ovate; the first segment is large, and equal to twice the combined length of the second, third, and fourth segments; the fifth thoracic segment is of about equal breadth with the narrow elongate abdomen; the colour of the second, third, and fourth segments is dark purple, and seems to be very little affected by a lengthened immersion in methylated spirit—the specimen figured was obtained in 1889, and though it has been in spirit since then, no perceptible change has taken place in the colour of these segments; the postero-lateral angles of the second and third segments are produced into tooth-like processes. Anterior antennæ slender, sixteen-jointed, sparingly setiferous; a sensory filament springs from the end of the third last joint. The subjoined formula shows the relative length of the joints :—

$$\frac{11\cdot9\cdot3\cdot3\cdot4\cdot5\cdot4\cdot4\cdot3\cdot\ 4\cdot\ 5\cdot\ 5\cdot\ 5\cdot\ 8\cdot\ 3\cdot11\cdot}{1\cdot2\cdot3\cdot4\cdot5\cdot6\cdot7\cdot8\cdot9\cdot10\cdot11\cdot12\cdot13\cdot14\cdot15\cdot16\cdot}$$

Posterior antennæ nearly as in *Cyclopicera gracilicauda*, Brady. Mandibles also nearly as in that species; mandible palp slender, bearing two apical setæ—one very long and plumose, and scarcely half as long, plain, and very slender (fig. 32). The two simple branches of the maxillæ are about equal in length, but one branch is more slender than the other, and bears three apical setæ, while the stout branch bears five setæ at the apex (fig. 33). The anterior foot-jaws are furnished with a long, slender, and curved terminal claw. Posterior foot-jaws four-jointed, elongate, slender, resembling those of *Cyclopicera nigripes* Brady and Robertson (fig. 35). The inner portion of the second basal joint of the first pair of swimming feet is considerably delated, and the inner branch is attached to this part, while the outer branch is attached to the very reduced exterior portion, so that though the two branches are of about equal length, the outer branch does not extend much beyond the second joint of the inner one; the joints of the inner branches are subequal. In the second, third, and fourth pairs the inner portion of the second basal joint is not so enlarged as in the first pair; the outer branches are considerably longer than the outer, and the first joint of the inner branches is much shorter than the second or third joints (figs. 36, 37). Fifth pair small, two-jointed; the breadth of the first joint is greater than the length, and the length of the secoud joint, which is narrower than the first, is greater than the breadth; a small seta springs from the anterior distal angle of the first joint, and also from each of the later angles of the truncate apex of the second joint, which is also armed with a large dagger-shaped apical spine, intermediate between the small angular setæ. Abdomen slender, composed of four segments of nearly equal breadth; genital segment nearly as long as the next three together; and the second segment is nearly equal to the combined length of the third and fourth. Caudal stylets slender, rather longer than the two last abdominal segments; the inner margin of each stylet is ciliated, the outer margin plain; terminal setæ, four unequal, the two intermediate densely plumose, and slightly thickened in the middle.

Habitat.—'Rath ground,' north of the Bass Rock, Firth of Forth, rare, in material dredged November 20th, 1889. One specimen was also obtained in some material dredged in 1892 off the south end of the Island of Mull.

Cyclopicera purpurocincta appears to be intermediate between *Cyclopicera gracilicauda* and *Cyclopicera nigripes*, but is at once distinguished from either by the colour of the second, third, and fourth thoracic segments.

Cyclopicera lata, Brady. (Pl. III. figs. 41, 42.)
1872. *Cyclopicera lata*, Brady, 'Nat. Hist. Trans. Northumb. and 'Durham,' vol. iv. p. 433, pl. xviii. figs. 3–8.
1868. *Ascomyzon echinicola*, Norman, 'Brit. Assoc. Report,' p. 300.
1880. *Cyclopicera lata*, Brady, 'Mon. Brit. Copep.,' vol. iii. p. 56, pl. lxxxix. fig. 12; pl. xc. figs. 11–14.

Habitat.—West of Gullane Ness, Firth of Forth. Washed from sponges, 1889. Several specimens were obtained. *Cyclopicera lata* closely resembles *Artotrogus boeckii*, Brady, which I have also obtained by washing *Chalina oculata* (a kind of sponge), and for this reason I had some doubts as to its being distinct, and deferred recording its occurrence; but having recently been enabled to make a careful examination of its structure, I have now no doubt that it is the species described as *Cyclopicera lata* in the Monograph of the British Copepoda: the structure of the anterior and posterior antennæ is the same, the mandible palp, which is very small, bears two apical setæ, one very long, slender, and sparsely plumose, and one very short (fig. 41). The abdomen is less robust, and the caudal stylets distinctly more elongate than in *Artotrogus boeckii*.

Genus *Parartotrogus*, T. and A. Scott (1893).

Parartotrogus richardi, T. and A. Scott. (Pl. IV. figs. 25–35.)
1893. *Parartotrogus richardi*, T. and A. Scott, 'Ann. and Mag. 'Nat. Hist.,' ser. 6, vol. xi. p. 210, pl. vii. figs. 1–11.

Habitat.—Near Fidra, Largo Bay, the 'Fluke Hole' (off St Monans), and other parts of the Forth between Inchkeith and May Island.

This species, which is only about the one-fiftieth of an inch in length, is readily distinguished by the peculiar subrhomboidal form of the cephalo-thorax (fig. 25). Seen from above, the sides of the cephalo-thorax diverge rapidly from the broad, almost truncate rostrum to about the middle of the first segment, where they form bluntly-rounded angles by again tapering quickly towards the last segment; the greatest breadth of the first segment is about equal to three-fifths of the entire length of the animal; the abdomen is moderately stout, and equal to about three-sevenths of the length of the cephalo-thorax. Anterior antenna, nine-jointed, sparingly setiferous, the third, fourth, and fifth joints much shorter than any of the others. The relative length of the joints is shown by the formula—

$$\frac{12 \cdot 12 \cdot 6 \cdot 5 \cdot 6 \cdot 10 \cdot 12 \cdot 13 \cdot 4 \cdot}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8 \cdot 9 \cdot}$$

Posterior antennæ four-jointed, and terminating in a stout hooked claw; a small curved and stout spine springs from near the middle of the last joint; secondary branch small, one-jointed, arising from the middle of the second joint, and bearing four slender apical setæ. Mandibles stylet-shaped, produced at the base into a barb-like process (fig. 28). Maxillæ two-branched, one branch stout, and bearing three apical spines and two plumose setæ, the other branch small, with three apical setæ (fig. 29). The first joint of the anterior foot-jaws stout, second joint elongate and slender, and terminating in a moderately long curved claw and a small spine (fig. 30). Posterior foot-jaw four-jointed; second joint about three times longer than broad, and bearing a small seta near the middle of the inner margin; third and fourth joints narrow, and together scarcely equal in length to two-thirds of the second joint; terminal claw rather longer than the two preceding joints, and provided with a small seta near the middle of the inner margin. Both branches of the first pair of swimming feet two-jointed, the second joint of the inner branch large and foliaceous (fig. 32). ? Third and fourth pairs somewhat similar to those of *Lichomolgus fucicolus*, Brady; slender, and with the marginal and terminal spines of the outer branches broadly dagger-shaped (figs. 33, 34). Fifth pair rudimentary, bilobed, with about three apical setæ (fig. 35, *a*). Genital segment of the abdomen considerably dilated; second and third segments short, and together scarcely equal in length to the first; last segment equal to twice the length of the preceding one; caudal stylets rather shorter than the last abdominal segment, furnished with five apical setæ, the second seta from the inside being considerably longer than the others, and about equal in length to the last three abdominal segments. Ovisacs two, large.

This species has been known to us since 1889, but, because of some uncertainty as to whether the first specimens obtained were mature, it was considered expedient to defer recording it. A few months ago a specimen with ovisacs was obtained, and quite recently several others, also with ovisacs, have been secured. By the discovery of these specimens our uncertainty as to the maturity of those previously obtained has in a great measure been set at rest.

Parartotrogus richardi resembles in some respects a curious parasitic copepod, described by Sir John Dalyell in 1851* under the name of *Cancerilla tubulata*, and which was discovered by him adhering to the base of one of the arms of a species of *Amphiura* (a kind of starfish). The same copepod has since been obtained on the coasts of France, and is described and figured by Dr Canu in his work 'Les Copepodes du 'Boulonnais.' But in *Cancerilla* the cephalo-thorax is greatly dilated, the abdomen is very short, the anterior antennæ are only six-jointed, and the first pair of swimming feet are more rudimentary than in *Parartotrogus*; and a further difference of considerable importance is, *Cancerilla* has only been obtained as a parasite, whereas all the specimens of *Parartotrogus* that have yet been obtained were free.

Genus *Bomolchus*, Nordman (1832).

Mikrograph. Beit. zur Naturg., II. Heft., s. 135–137.

Animal somewhat like *Lichomolgus* in form. Anterior antennæ seven-jointed. Posterior antennæ three-jointed. (?) Mandibles stylet-shaped. Maxillæ simple, the apex truncate, and provided with two broadly ovate appendages. Foot-jaws rudimentary; (?) anterior footjaw, consisting of a simple stylet-shaped joint, bearing a single plumose seta. Both branches of all the swimming feet three-jointed, first pair short, foliaceous, furnished with spathulate and densely-plumose setæ; the second, third, and fourth pairs rather longer, the outer branches armed with hooked marginal spines. Fifth pair nearly as in *Lichomolgus.*

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* *The Powers of the Creator*, vol. i. p. 233, pl. lxii. figs. 1–5.

Bomolchus soleæ, Claus. (Pl. V. figs. 1–13.)
1864. *Bomolchus soleæ*, Claus, Zeitschrift fur Wissenschaft zool. vol. xiv. p. 374, pl. 35, figs. 16–20.

Length, exclusive of tail setæ, 1·3 mm. Anterior antennæ furnished with numerous moderately long and densely plumose seta; the relative length of the joints are shown by the formula—

$$\frac{25 \cdot 15 \cdot 15 \cdot 17 \cdot 15 \cdot 11 \cdot 13 \cdot}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7.}$$

Middle joint of posterior antennæ short, bearing a single small hair, the last joint covered with small prickles and furnished with three pectinate setiferous appendages and three apical setæ (fig. 3). The mandibles (?) have the basal portion considerably dilated, and the terminal portion curved and stylet-shaped (fig. 4). First pair of swimming feet short, broadly foliaceous, somewhat distorted; joints of inner branch subequal in length; the middle joint of the outer branch very short (fig. 7). The second and third pairs longer and much narrower comparatively than the first; inner margins furnished with elongate, densely plumose setæ; the exterior margin and end of the outer branches armed with stout spines bearing terminal hook-like processes; joints of the inner branches subequal; middle joint of outer branches shorter than either of the other two (fig. 8). In the fourth pair the inner branches are rather longer than the outer, but otherwise this pair is similar to the second and third. The fifth pair consist each of a single two-jointed branch; the first joint is very short, the second is about four times the length of the first, and is provided with three terminal and one marginal setæ. Abdomen short, tapering from the somewhat stout genital segment; the third, fourth, and fifth segments shorter than the preceding one. Caudal stylets rather longer than the last abdominal segment; the principal caudal seta is about one and a half times longer than the abdomen; other tail setæ short.

Habitat.—"Fluke Hole" off St Monans, Firth of Forth. This curious copepod seems to be closely allied to the *Saphirinidæ*, and probably belongs to that group. The peculiar structure of the first pair of swimming feet give it a somewhat abnormal character. New to Britain.

Besides the *Copepoda* now described, there are still some others that do not apparently agree with known species, and which are held over for further study.

AMPHIPODA.

GAMMARIDÆ.

Genus *Anonyx*, Kroyer (1838).

Anonyx nugax, Phipps. (Pl. V. figs. 18–21.)
Cancer nugax, Phipps, 'Voyage au Pöle boréale,' p. 192, pl. 12, fig. 8.
Anonyx ampulla, Kröyer (not Phipps).
1891. *Anonyx nugax*, G. O. Sars, 'Crust. of Norway,' vol. i. p. 88, pl. 31.

Several specimens of this fine species were obtained in February 1889, near May Island, Firth of Forth, but were not then recorded; it was only when I read the description in G. O. Sars' excellent work, the 'Crustacea 'of Norway,' that the species was recognised. The largest of the Forth specimens measure 20 mm. (fully three-quarters of an inch) in length.

The eyes are lageniform, and, being large and black, give a marked character to the species.

Genus BATHYPOREIA, Lindström (1855).

Bathyporeia norvegica, G. O. Sars. (Pl. V. fig. 22.)
Bathyporeia pilosa, Boeck (not Lindström).
1891. *Bathyporeia norvegica*, G. O. Sars, *loc. cit.*, p. 128, pl. 43.
1892. *Bathyporeia norvegica*, T. and A. Scott, 'Ann. and Mag. 'Nat. Hist.,' s. 6, vol. x. p. 205.

Specimens of this species are occasionally obtained in various parts of the Firth of Forth. It may be distinguished by its larger size, and especially by the tooth-like form of the postero-lateral angles of the epimeral plates of the third metasome.

Bathyporeia pelagica, Sp. Bate. (Pl. V. figs. 23–25.)
1862. *Bathyporeia pelagica*, Sp. Bate, 'Cat. Amphip. Brit. Mus.,' p. 174, pl. xxxi. fig. 6.
1891. *Bathyporeia pelagica*, G. O. Sars, *op. cit.*, p. 129, pl. 44, fig. 1.

After a careful examination of a considerable number of Forth specimens of *Bathyporeia*, I have been enabled, with the assistance of Prof. G. O. Sars' 'Crustacea of Norway,' to distinguish this and the following species. The exceedingly long flagellum of the posterior antennæ of the adult male enables *Bathyporeia pelagica* to be readily distinguished except from *Bathyporeia norvegica;* but in this case, not only is there a difference in size, there is also the difference in the form of the epimeral plates of the third metasome, which, in all but *Bathyporeia norvegica*, have postero-lateral angles more or less rounded. In *Bathyporeia pelagica* the dorsal flexure of the first urosome is very marked, and the four small submedian setæ on its lower convex portion are present on all the specimens observed in the Forth; the two lower ones are short, stout, and distinctly spiniform.

Bathyporeia robertsoni, Sp. Bate. (Pl. V. figs. 26–29.)
1862. *Bathyporeia robertsoni*, Sp. Bate, 'Cat. Amphip. Brit. Mus.,' p. 173, pl. xxxi. fig. 5.
1891. *Bathyporeia robertsoni*, G. O. Sars, *op. cit.*, p. 131, pl. 44, fig. 2.

In this species the flagellum of the adult male posterior antennæ is comparatively short, and the first urosome wants the two posterior submedian dorsal spiniform setæ; it also differs in having the last joint of the last pair of uropods very small. In the 'Revised List of the Crus- 'taceæ of the Firth of Forth,' *Bathyporeia pelagica* and *Bathyporeia robertsoni* are included under *Bathyporeia pilosa*, Lindström, as forms of that species.

Genus *Argissa*, Boeck (1870).

Argissa hamatipes (Norman). (Pl. V. figs. 30, 31.)
1868. *Syrrhoe hamatipes*, Norman, Report on Dredging among the Shetland Islands (in 'Report of the 38th Meeting of the 'British Association, 1868,' London, 1868).
1870. *Argissa typica*, Boeck, 'Crust. Amphip. bor. et arct.,' p. 45.
1891. *Argissa typica*, G. O. Sars, *op. cit.*, p. 141, pl. 48.

This curious and somewhat anomalous Amphipod has been observed during the past autumn and winter in various parts of the Forth. It has also been obtained in Aberdeen Bay. One of its peculiar characteristics is the structure of the eyes, which consist of four pairs of small lenses about equidistant from each other, and arranged round the circumference of a nearly circular patch of pigment. In the male the second segment of the urosome has the dorsal part produced backward in the form of a free tooth-like process, that extends to nearly the end of the next segment.

Argissa hamatipes has been recorded for Shetland (Norman) and for the Clyde district (Robertson).

Genus *Ampelisca*, Kroyer (1842).

Ampelisca assimilis, Boeck. (Pl. V. figs. 32–35.)
1870. *Ampelisca assimilis*, Boeck, 'Crust. Amphip. bor. et arct.,' p. 142.
1891. *Ampelisca assimilis*, G. O. Sars, *op. cit.*, p. 168, pl. lviii. fig. 2.

Habitat.—Vicinity of May Island. Apparently scarce.

This, which is one of the smaller species, is distinguished by the anterior antennæ reaching very little beyond the end of the basal joints of the posterior antennæ; the two last basal joints of the posterior antennæ are of about equal length. The epimeral plates of the last segment of the mesosome have the postero-lateral angles broadly rounded. The telson is rather longer than broad; sides of the proximal half straight and parallel; of the distal half slightly rounded, and converging to the blunt-pointed apex, and bearing a few very small marginal setæ.

Mr Robertson records this species from the Clyde.

Ampelisca lævigata, Lilljeborg. (Pl. V. figs. 36, 37.)
1855. *Ampelisca lævigata*, Lilljeborg, 'Ofv. af. Kgl. Vet. Akad. 'Förh.,' p. 123.
1862. *Ampelisca Belliana*, Sp. Bate, 'Cat. Amphip. Crust. Brit. 'Mus.,' p. 93, pl. xv. fig. 3.
1891. *Ampelisca lævigata*, G. O. Sars, *op. cit.*, p. 169, pl. lii. fig. 1.

Habitat.—Largo Bay and one or two other places in the Firth of Forth, but not common.

In this species the anterior antennæ scarcely reach to the end of the basal joints of the posterior antennæ. The penultimate basal joint of the posterior antennæ is considerably longer than the next, and the flagellum is comparatively short, being less than twice the length of the peduncle. The posterior pair of pereiopoda are robust; the meral joint is produced exteriorly, and forms a lobe-like process as long as the next joint, and densely fringed with cilia. The postero-lateral margins of the epimeral plates of the last segment of the mesosome are doubly and strongly sinuate, the postero-lateral angles being produced into acutely slender teeth. Telson moderately broad, with a pointed apex.

According to Professor G. O. Sars, this species is the *Ampelisca belliana* of Sp. Bate, and *Ampelisca lævigata*, Sp. Bate, is the same as *Ampelisca tenuicornis*, Lilljeborg, which was described by Lilljeborg in 1855.

Ampelisca spinipes, Boeck. (Pl. V. figs. 38–40.)
1870. *Ampelisca spinipes*, Boeck, 'Crust. Amphip. bor. et arct.,' p. 143.
1891. *Ampelisca spinipes*, G. O. Sars, *op. cit.*, p. 173, pl. 60, fig. 2.

Habitat.—Vicinity of May Island, Firth of Forth. Not common.

The superior antennæ of *Ampelisca spinipes* are proportionally much longer than in the last species, as they extend considerably beyond the end of the peduncle of posterior antenna. The terminal joints of the last pair of pereiopods are comparatively narrow. The posterior margin of the expanded plate of the basal joint bends obliquely upwards at a moderately acute angle. The postero-lateral angles of the epimeral plates of the last segment of the mesosome are nearly rectangular. The telson is comparatively narrow. Length of Forth specimens, 15 mm.

Genus *Amphilochoides*, G. O. Sars (1892).

Amphilochoides odontonyx, Boeck. (Pl. V. figs. 41, 42.)

1870. *Amphilochoides odontonyx*, Boeck, 'Crust. Amphip. bor. et 'arct.,' p. 51.

1892. *Amphilochoides odontonyx*, G. O. Sars., *op. cit.*, p. 221, pl. lxxv. fig 2.

Habitat.—Vicinity of Fidra Island, Firth of Forth.

This, though a small species, is quite easily distinguished from *Amphilochus manudens*, which it resembles in size and form by the structure of the gnathopods. The inner edge of the dactylus of the first and second gnathopods, but especially of the second pair, is produced near the hinge into a small but quite distinct blunt-pointed tooth, that interlocks into an opposing notch on the palm. It is further distinguished from *Amphilochoides pusillus*, G. O. Sars, which has the claws of second pair of gnathopods similarly toothed, by the postero-lateral margins of the epimeral plates of the third segment of the mesosome being sinuate, and the angles slightly produced and tooth-like. Professor Sars does not give (*loc. cit.*) any British locality for *Amphilochoides odontonyx*, but, on the authority of Meinert, records its occurrence in the Kattegat and Skagerak. He has also obtained it in a few places off the west coast of Norway. Mr David Robertson, of Millport, records its occurrence in the Clyde district.

Genus *Cerapus*, Say (1817).

Cerapus crassicornis (Spence, Bate).

1855. *Siphonœcetes crassicornis*, Sp. Bate, 'Rep. Brit. Assoc.,' p. 59.

1857. *Siphonœcetes crassicornis*, White, 'Pop. Hist. Brit. Crust.,' p. 197.

This species was obtained among some material collected by a tow-net fixed to the head of the beam-trawl. It occupied a tube a little longer than itself, composed of blackish mud, held together by some kind of glutinous substance. It was able to move freely about with its tube, and to withdraw itself at pleasure. Only one specimen has been obtained.

CUMACEA.

Genus *Petalomera*, Stimpson (1858).

Petalomera declivis, G. O. Sars. (Pl. V. fig. 43.)

1892. *Petalomera declivis*, T. and A. Scott, 'Ann. and Mag. Nat. Hist.,' ser. vi., vol. x. p. 206.

This Cumacean was obtained in Largo Bay in 1892. It appears to be a rare species in the Firth of Forth. More recently (April 1893) several specimens were obtained in bottom material collected a few miles east of May Island.

EXPLANATION OF THE PLATES.

Plate II.

Longipedia coronata, Claus (♀).

Fig. 1.	Female, dorsal view,	× 32
Fig. 2.	Anterior antenna,	× 152
Fig. 3.	Posterior antenna,	× 152
Fig. 4.	Mandible and palp,	× 190
Fig. 5.	Maxilla,	× 127
Fig. 6.	Anterior foot-jaw,	× 190
Fig. 7.	Posterior foot-jaw,	× 152
Fig. 8.	Foot of first pair of swimming feet,	× 100
Fig. 9.	Foot of second pair,	× 95
Fig. 10.	Foot of third pair,	× 100
Fig. 11.	Foot of fourth pair,	× 100
Fig. 12.	Foot of fifth pair,	× 190
Fig. 13.	Abdomen and caudal stylets,	× 53

Longipedia coronata, var. *minor*, T. and A. Scott.

Fig. 14.	Female, dorsal view,	× 40
Fig. 15.	Anterior antenna—male,	× 190
Fig. 16.	Foot of second pair of swimming feet—female,	× 127
Fig. 17.	Foot of second pair of do.—male,	× 127
Fig. 18.	Foot of fifth pair—female,	× 190
Fig. 19.	Last abdominal segment and caudal stylets,	× 80
Fig. 20.	Portion of last thoracic segment and first abdominal segment—male (*a.* fifth foot; *b.* abdominal appendage),	× 23

Canuella perplexa, T. and A. Scott.

Fig. 21.	Female, dorsal view,	× 32
Fig. 22.	Anterior antenna—female,	× 152
Fig. 23.	Anterior antenna—male,	× 152
Fig. 24.	Posterior antenna,	× 190
Fig. 25.	Mandible,	× 190
Fig. 26.	Maxilla,	× 190
Fig. 27.	Anterior foot-jaw,	× 190
Fig. 28.	Posterior foot-jaw,	× 190
Fig. 29.	Foot of first pair of swimming feet,	× 152
Fig. 30.	Foot of second pair,	× 100
Fig. 31.	Foot of third pair,	× 100
Fig. 32.	Foot of fourth pair,	× 84
Fig. 33.	Fifth pair of thoracic feet,	× 506
Fig. 34.	Genital segment, ventral view—female,	× 127
Fig. 35.	Genital segment, ventral view—male,	× 127

Plate III.

Jonesiella hyænæ, I. C. Thompson (♀).

Fig. 1.	Female, dorsal view,	× 64
Fig. 2.	Anterior antenna,	× 330
Fig. 3.	Posterior antenna,	× 300
Fig. 4.	Mandible palp,	× 380
Fig. 5.	Foot of first pair of swimming feet,	× 200
Fig. 6.	Foot of fifth pair,	× 300

Dactylopus rostratus, sp. nov.

Fig. 7.	Female, dorsal view,	× 42
Fig. 8.	Anterior antenna and rostrum—female,	× 152
Fig. 9.	Anterior antenna—male,	× 200
Fig. 10.	Posterior antenna,	× 170
Fig. 11.	Mandible and palp,	× 300
Fig. 12.	Maxilla,	× 253
Fig. 13.	Posterior foot-jaw,	× 380
Fig. 14.	Foot of first pair of swimming feet,	× 127
Fig. 15.	Foot of second pair—male,	× 127
Fig. 16.	Foot of fourth pair,	× 127
Fig. 17.	Foot of fifth pair—female,	× 127
Fig. 18.	Foot of fifth pair—male,	× 190
Fig. 19.	Last abdominal segments and caudal setæ,	× 84
Fig. 20.	Spermatophore,	× 127

(?) *Cletodes longiremis*, sp. nov.

Fig. 21.	Female, dorsal view,	× 92
Fig. 22.	Anterior antenna,	× 380
Fig. 23.	Posterior antenna,	× 380
Fig. 24.	Mandible and palp,	× 506
Fig. 25.	Foot of first pair of swimming feet,	× 506
Fig. 26.	Foot of second pair,	× 253
Fig. 27.	Foot of fourth pair,	× 253
Fig. 28.	Foot of fifth pair,	× 570

Cyclopicera purpurocincta, sp. nov.

Fig. 29.	Female, dorsal view,	× 70
Fig. 30.	Anterior antenna and rostrum,	× 230
Fig. 31.	Posterior antenna,	× 480
Fig. 32.	Mandible and palp,	× 325
Fig. 33.	Maxilla,	× 325
Fig. 34.	Anterior foot-jaw,	× 253
Fig. 35.	Posterior foot-jaw,	× 200
Fig. 36.	Foot of first pair of swimming feet,	× 220
Fig. 37.	Foot of second pair,	× 163
Fig. 38.	Foot of fourth pair,	× 190
Fig. 39.	Foot of fifth pair,	× 506
Fig. 40.	Abdomen and caudal stylets,	× 80

Cyclopicera lata, Brady.

Fig. 41.	Mandible and palp,	× 253
Fig. 42.	Abdomen and caudal stylets,	× 127

PLATE IV.

Lichomologus hirsutipes, sp. nov.

Fig. 1.	Female, dorsal view,	× 48
Fig. 2.	Anterior antenna,	× 100
Fig. 3.	Posterior antenna,	× 100
Fig. 4.	Mandible and palp,	× 333
Fig. 5.	Anterior foot-jaw,	× 380
Fig. 6.	Posterior foot-jaw—female,	× 200
Fig. 7.	Posterior foot-jaw – male,	× 300
Fig. 8.	Foot of first pair of swimming feet,	× 152
Fig. 9.	Foot of fourth pair,	× 152
Fig. 10.	Foot of fifth pair—female,	× 200
Fig. 11.	Foot of fifth pair—male,	× 380
Fig. 12.	Abdomen and caudal stylets,	× 64

Modiolicola insignis, Aurivillius.

Fig. 13.	Female, dorsal view,	× 54
Fig. 14.	Anterior antenna,	× 253
Fig. 15.	Posterior antenna,	× 170
Fig. 16.	Mandible and palp,	× 455
Fig. 17.	Anterior foot-jaw,	× 253
Fig. 18.	Posterior foot-jaw—female,	× 380
Fig. 19.	Posterior foot-jaw—male,	× 300
Fig. 20.	Foot of first pair of swimming feet,	× 152
Fig. 21.	Foot of fourth pair,	× 127
Fig. 22.	Foot of fifth pair,	× 380
Fig. 23.	Abdomen and caudal stylets—female,	× 63
Fig. 24.	Abdomen and caudal stylets—male,	× 115

Parartotrogus richardi, T. and A. Scott.

Fig. 25.	Female, dorsal view,	× 126
Fig. 26.	Anterior antenna,	× 253
Fig. 27.	Posterior antenna,	× 253
Fig. 28.	Mandible,	× 460
Fig. 29.	Maxilla,	× 253
Fig. 30.	Anterior foot-jaw,	× 253
Fig. 31.	Posterior foot-jaw,	× 253
Fig. 32.	Foot of first pair of swimming feet,	× 253
Fig. 33.	Foot of third pair,	× 253
Fig. 34.	Foot of fourth part,	× 253
Fig. 35.	Abdomen and caudal stylets (*a.* fifth foot),	× 170

Delavalia æmula, sp. nov.

Fig. 36.	Female, lateral view,	× 80
Fig. 37.	Anterior antenna—female,	× 253
Fig. 38.	Anterior antenna—male,	× 325
Fig. 39.	Posterior antenna,	× 200
Fig. 40.	Mandible and palp,	× 335
Fig. 41.	Posterior foot-jaw,	× 506
Fig. 42.	Foot of first pair of swimming feet,	× 253
Fig. 43.	Foot of second pair—male,	× 300
Fig. 44.	Foot of fourth pair,	× 152
Fig. 45.	Foot of fifth pair—female,	× 380
Fig. 46.	Foot of fifth pair—male,	× 300
Fig. 47.	Last abdominal segment and caudal stylets,	× 152

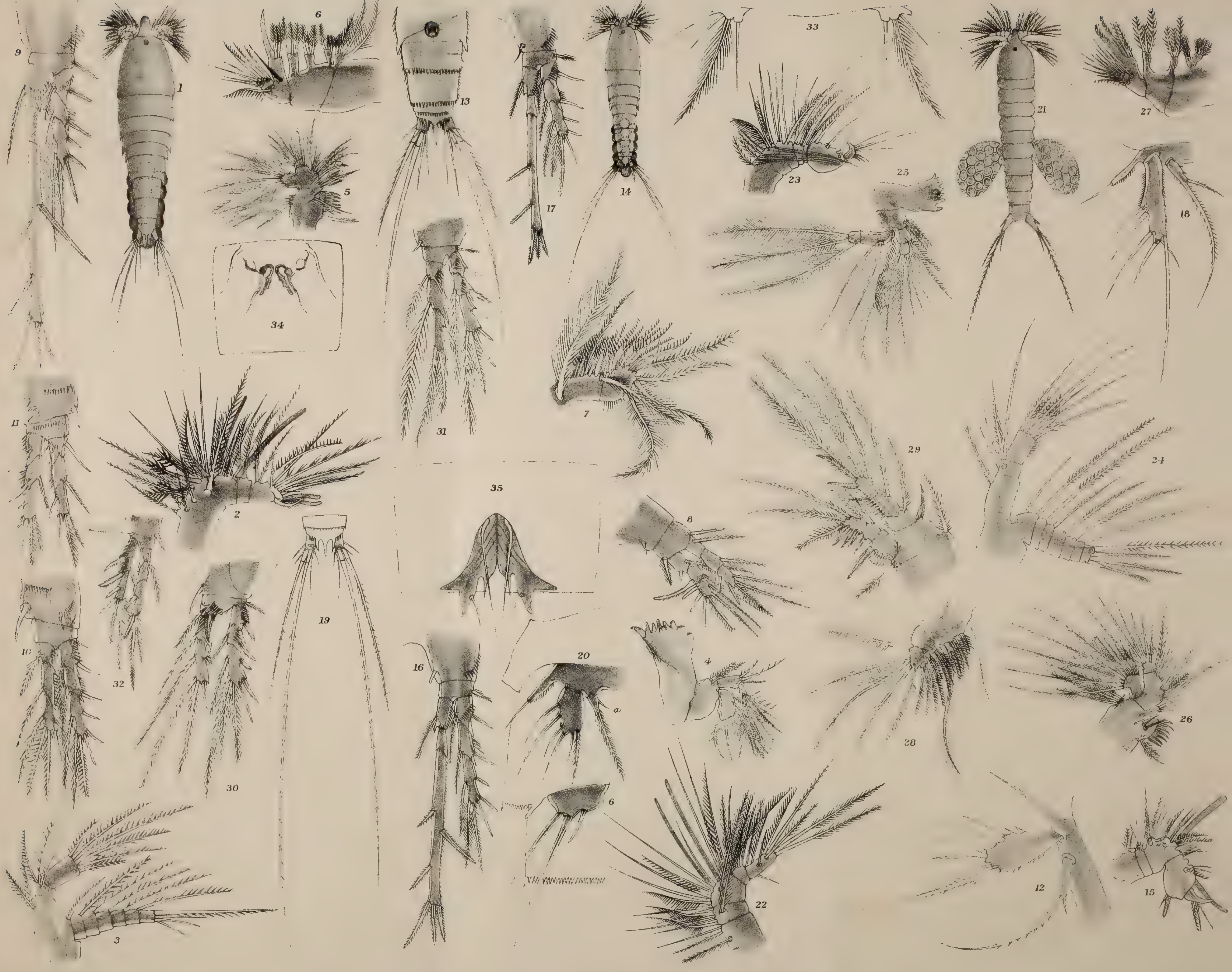
PLATE V.

Bomolchus soleæ, Claus.

Fig. 1.	Female, dorsal view,	× 40
Fig. 2.	Anterior antenna,	× 190
Fig. 3.	Posterior antenna,	× 127
Fig. 4.	Mandible,	× 300
Fig. 5.	Maxilla,	× 380
Fig. 6.	(?) Anterior foot-jaw,	× 380
Fig. 7.	Foot of first pair of swimming feet,	× 163
Fig. 8.	Foot of second pair,	× 127
Fig. 9.	Foot of fourth pair,	× 127
Fig. 10.	Foot of fith pair,	× 127

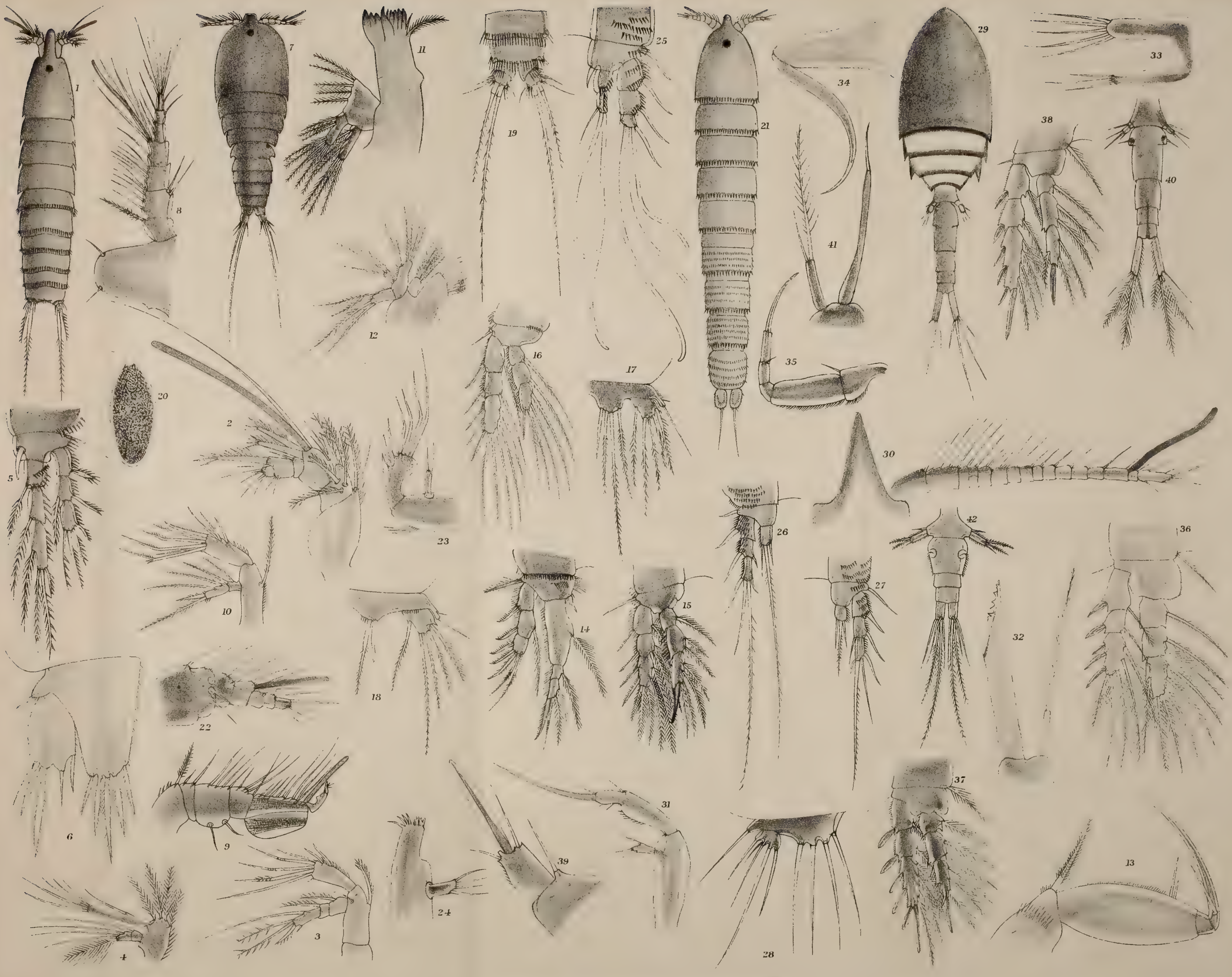
Platychelipus littoralis, Brady.

Fig. 11.	Female, dorsal view,	× 70
Fig. 12.	Foot of first pair of swimming feet,	× 253
Fig. 13.	Foot of fifth pair,	× 169



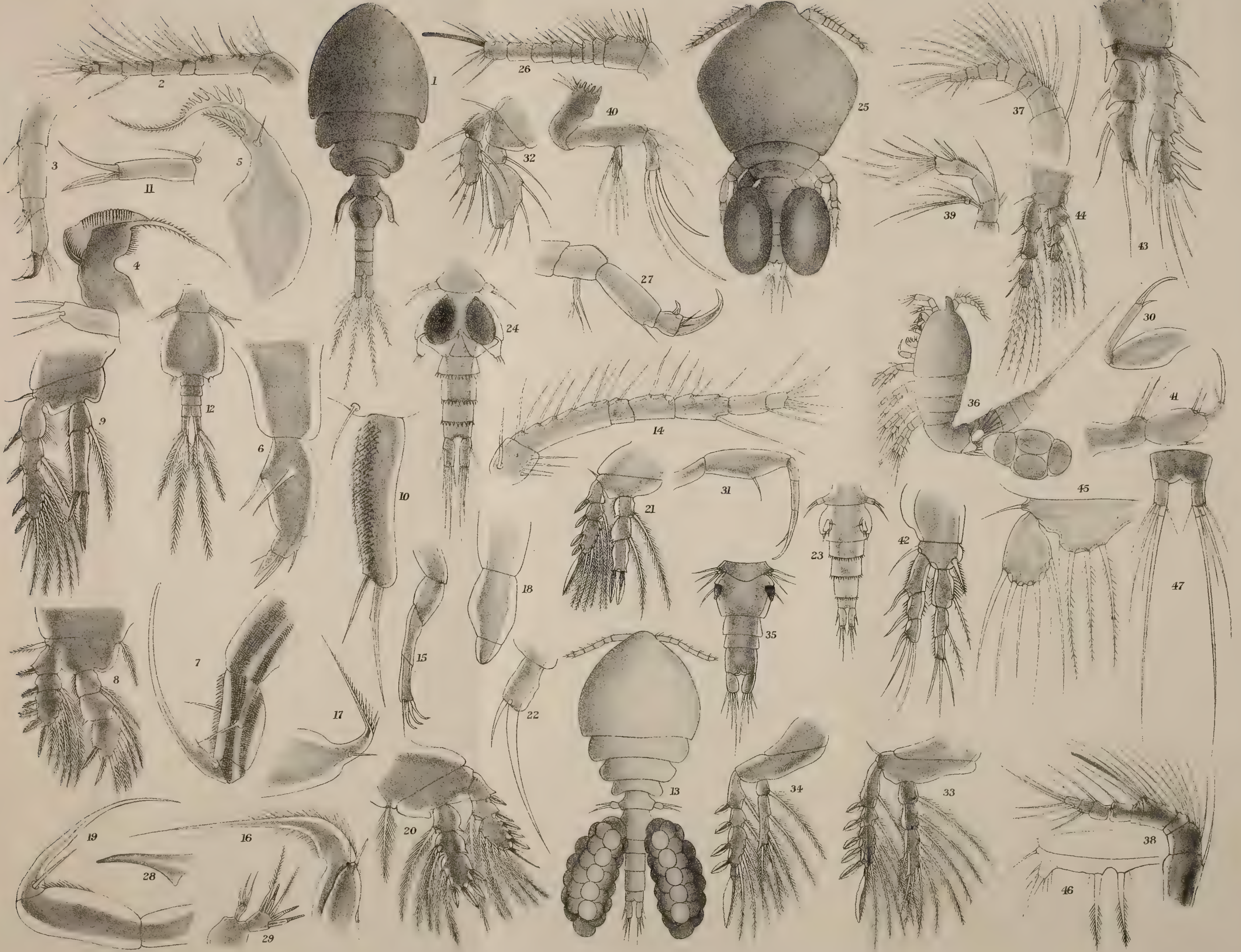
Andrew Scott, del. ad nat.

Figs. 1 13.—Longipedia coronata *Claus*. Figs. 14 20.—Longipedia coronata, *var*, minor. Figs. 21 35.—Canuella perplexa *T. and A. Scott*.



Andrew Scott, del. ad nat.

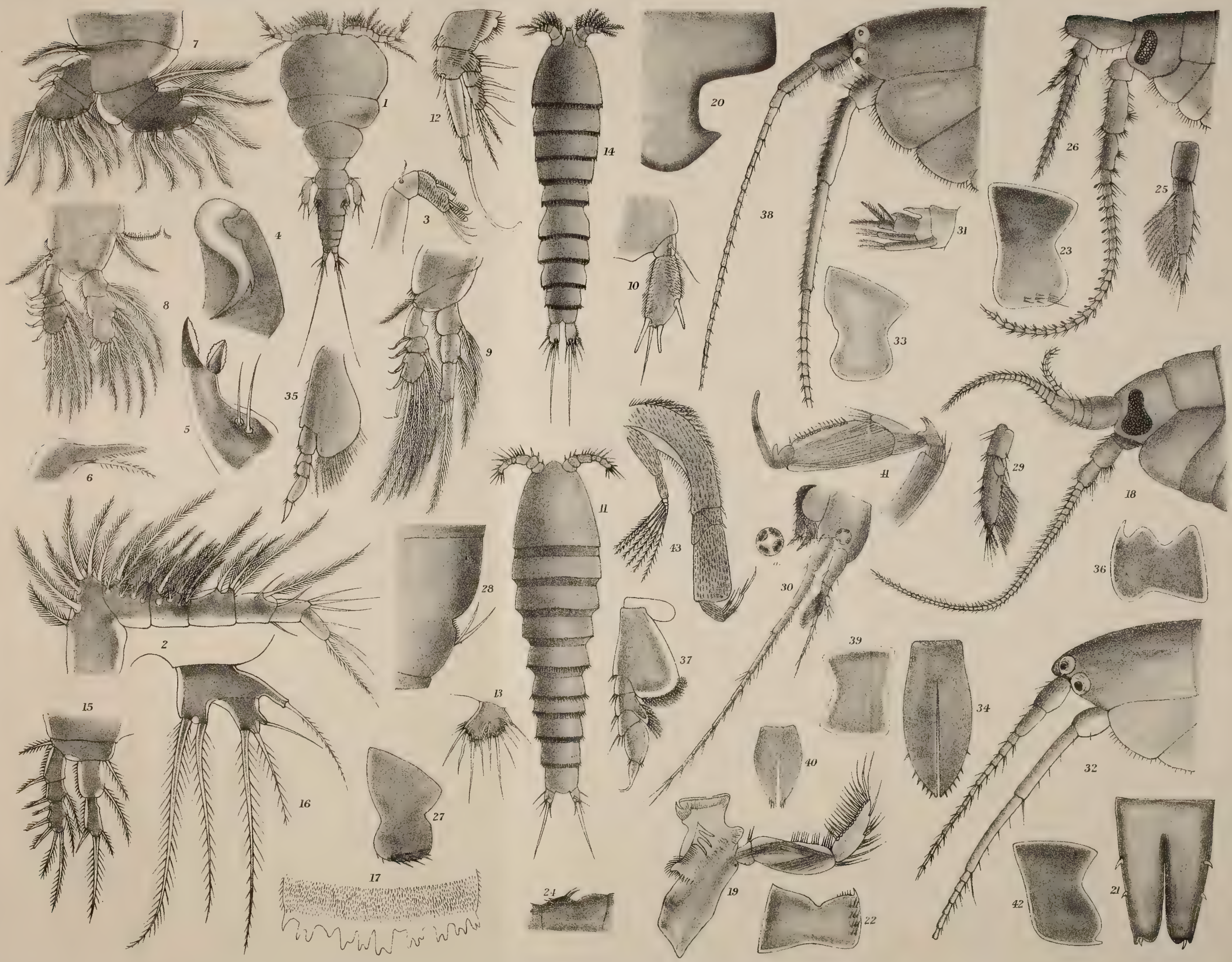
Figs. 1 6. -Jonesiella hyænæ *I. C. Thompson*. Figs. 7 20.—Dactylopus rostratus, *sp. n.* Figs. 21 28.—? Cletodes tenuiremis, *sp. n.* Figs. 29 40.—Cyclopicera purpurocincta, *sp. n.*
Figs. 41 42.—Cyclopicera lata (*Brady*).



Figs. 1 12.—Lichomolgus hirsutipes, *sp. n.* Figs. 13 24.—Modiolicola insignis *Aurivillius.* Figs. 25 35.—Parartotrogus richardi *T. and A. Scott.*
Figs. 36 47.—Delavalia æmula, *sp. n.*

Andrew Scott, del. ad nat.

Figs. 1 10.—**Bomolchus soleæ** *Claus*. Figs. 11 13.—**Platychelipus littoralis** *Brady*. Figs. 14 17.—**Zosime typica** *Boeck*. Figs. 18 21.—**Anonyx nugax** *Phipps*.
Fig. 22.—**Bathyporeia norvegica** *G. O. Sars*. Figs. 23 25.—**Bathyporeia pelagica** *Sp. Bate*. Figs. 26 29.—**Bathyporeia robertsoni** *Sp. Bate*. Figs. 30 31.—**Argissa hamatipes** (*Norman*).



Figs. 32 35.—**Ampelisca assimilis** *Boeck*. Figs. 36 37.—**Ampelisca lævigata** *Lilljeborg*. Figs. 38 40.—**Ampelisca spinipes** *Boeck*. Figs. 41 42.—**Amphilochoides odontonyx** (*Boeck*).
Fig. 43.—**Petalomera declivis** *G. O. Sars*.

Andrew Scott, del. ad nat.

Zosime typica, Boeck.

Fig. 14.	Female, dorsal view,	× 70
Fig. 15.	Foot of first pair of swimming feet,	× 253
Fig. 16.	Foot of fifth pair,	× 338
Fig. 17.	Second-last abdominal segment,	× 380

Anonyx nugax (Phipps).

Fig. 18.	Cephalon with superior and inferior antennæ,	× 7·6
Fig. 19.	Mandible and palp,	× 20
Fig. 10.	One of the last epimeral plates of metasome,	× 9
Fig. 21.	Telson,	× 26

Bathyporeia norvegica, G. O. Sars.

Fig. 22.	One of the last epimeral plates of metasome,	× 13

Bathyporeia pelagica, Sp. Bate.

Fig. 23.	One of the last epimeral plates of metasome,	× 26
Fig. 24.	Dorsum of first segment of urosome,	× 26
Fig. 25.	One of the last pair of uropods,	× 26

Bathyporeia robertsoni, Sp. Bate.

Fig. 26.	Cephalon with superior and inferior antennæ,	× 21
Fig. 27.	One of the last epimeral plates of metasome,	× 16
Fig. 28.	Dorsum of first segment of urosome,	× 40
Fig. 29.	One of the last pair of uropods,	× 20

Argissa hamatipes (Norman).

Fig. 30.	Cephalon with superior and inferior antennæ (*a.* eye),	× 24
Fig. 31.	Urosome,	× 21

Ampelisca assimilis, Boeck.

Fig. 32.	Cephalon with superior and inferior antennæ,	× 26
Fig. 33.	One of the epimeral plates of metasome,	× 13
Fig. 34.	Telson,	× 40
Fig. 35.	One of the last pair of pereiopods,	× 13

Ampelisca laevigata, G. O. Sars.

Fig. 36.	One of the last epimeral plates of metasome,	× 21
Fig. 37.	One of the last pair of pereiopods,	× 20

Ampelisca spinipes, Boeck.

Fig. 38.	Cephalon with superior and inferior antennæ,	× 21
Fig. 39.	One of the last epimeral plates of metasome,	× 8
Fig. 40.	Telson,	× 13

Amphilochoides odontonyx (Boeck).

Fig. 41.	One of the second gnathopods,	× 53
Fig. 42.	One of the last epimeral plates of metasome,	× 18

Petalomera declivis, G. O. Sars.

Fig. 43.	One of the thoracic appendages,	× 40

III.—THE INVERTEBRATE FAUNA OF THE INLAND WATERS OF SCOTLAND. PART III. By THOMAS SCOTT, F.L.S. (Plates VI., VII.)

LOCH MORAR, INVERNESS-SHIRE.

Introduction.

I was requested to visit this loch in September last year (1892), to make an investigation of its invertebrate fauna, and to obtain some information concerning the depth of the loch, the specific gravity of its bottom water, &c.

Mr Anderson Smith, one of the members of the Fishery Board, who was at this time engaged on board the fishery steamer 'Garland,' in carrying on an extensive series of observations—biological and physical—among the islands and fiords of the West of Scotland, assisted me very materially in carrying out the work that I had been requested to take in hand.

I was conveyed on board the 'Garland' to Tarbet, Loch Nevis, where there is a nice sheltered little bay, and where there is a small inn, at which boats and men for Loch Morar may be obtained or arranged for. There is a fairly good road leading from Tarbet Inn to Loch Morar, which is only about three-quarters of a mile, if so much, distant. The inn is nearly midway between the upper and lower ends of the loch, and forms an excellent rendezvous for anglers and others who desire to work the upper as well as the lower ends. Unfortunately, the inn is not readily accessible for visitors, being much out of the way of steamers and coaches. The nearest port of call for steamers is Arisaig, which is, therefore, the usual landing-place for visitors to this district.

The road leading from Tarbet Inn to Loch Morar is formed through what appears to be a 'fault' in the schistoze rocks that form the barrier between Loch Nevis and Loch Morar; this road gradually rises to a height of about 200 feet, then descending towards Loch Morar, it continues westward along the north side and round the lower or west end of the loch, and thence to Arisaig. This is the road by which the postman from Arisaig reaches Tarbet Inn. I understand he comes three times a week to the inn during the summer, and twice a week during the winter months. Tarbet Inn is thus the postal terminus in this district. A little sheltered bay in Loch Morar, opposite Tarbet Bay, Loch Nevis, is called South Tarbet Bay. Along the north side of Loch Morar, from South Tarbet Bay eastward, there is no road deserving the name: there is, indeed, a kind of pathway, but of such a break-neck character that it requires some experience and 'nerve' to traverse it safely. There appears to be no road along the whole of the south side, with the exception of a pathway similar to that described.

Loch Morar is justly described as 'a large and beautiful loch amid 'magnificent scenery;'* it lies nearly due east and west, between stupendous ridges of rocks, sparsely clothed with vegetation, and which, in many places, rise precipitously from the water's edge to summits of over 1000 feet in height, and in one or two instances to summits of over 2000 feet in height, at a distance of less than a half to three-quarters of a mile from the edge of the loch. Towards the lower end the sides, though rugged, are less steep and precipitous. At the upper end three streams enter the loch from the westward; one of these issues from a deep, gloomy ravine or cañon, which terminates abruptly in bold headlands. The loch is shallow at its extreme upper or east end, and there is a considerable extent of nearly level marsh and meadow land that has probably been formed by the silting up of this part of the loch. The length of Loch Morar, as shown on the 'one-inch' Ordnance Survey Map, is a little over 11½ statute miles, but in the *Sportsman's Guide* it is stated to be 'about '14 miles long;'* the narrowest part (about 3¼ furlongs) is near the east end, at Sron an Drutain, and the greatest width (1 mile 4¾ furlongs) is at the west end, near Bracorina. Several streams flow into the loch along both the north and south sides: the largest is the River Meoble, formed by the overflow waters of Loch Beoraid (a small loch about 3 miles south of Loch Morar), and augmented by several rivulets in its course northwards, to where it falls into Loch Morar, near Camas Luinge, nearly opposite, but a little west of, South Tarbet Bay. The overflow waters of Loch Morar form the River Morar, which, flowing from the west end, and after a tortuous course of about 1¾ miles, falls into the Atlantic. The normal height of Loch Morar is about 31 feet above sea-level, but the height varies considerably according as the season may be wet or dry.

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* *Sportsman's Guide to the Rivers, Lochs, Moors, and Deer Forests of Scotland*, September 1890, p. 220.

'Loch Morar belongs to Lord Lovat, Mr J. A. Macdonald of Glenala-'dale, Mrs Campbell of Callert, and Mrs Nicholson of Arisaig and Morar; 'it contains salmon, sea-trout, and loch-trout in great abundance, and yields 'good sport to the angler. The loch fishes well all the summer months, 'but salmon never rise well.' † It may be remarked here, by way of comparison, that angling for salmon in Loch Ness—also a deep loch—is usually not very successful, though these fish abound in that loch also.

Depth of Loch Morar.

Loch Morar was sounded at four different places, as near as possible in mid-channel, and here referred to as Stations I., II., III., and IV. The extreme upper end of the loch is shallow, but, proceeding westward from the head of the loch, the depth rapidly increases, so that at Station I. (about 7 furlongs from the head of the loch) the sounding-lead touched bottom at a depth of 59⅔ fathoms (358 feet); the depth continued still further to increase, so that at Station II., a little over a mile from Station I., the sounding-lead touched bottom at 100 fathoms (600 feet). At Station III. (a little west of Aron Mhor, or a little over 3½ miles from the head of the loch) we obtained 103⅔ fathoms (622 feet); the bottom at Stations I. to III. appeared to be rock or gravel. Three soundings were taken in the vicinity of Station IV. (about 3 furlongs west of South Tarbet Bay). The first was with the dredge, which touched bottom, — the line being straight up and down,—at 170 fathoms (1020 feet); when hauled up the dredge-bag contained a quantity of fine mud. The second sounding was taken with the sounding-lead (with reversing thermometers attached); the bottom was touched at 156⅚ fathoms (941 feet). The third sounding was taken with the self-locking water-bottle, let down for a sample of bottom water, and which when hauled up contained a mixture of water and impalpable mud; the water-bottle touched bottom at 145 fathoms (870 feet). The difference in depth shown by these three separate soundings may, I think, be easily accounted for, in this way: the distance of Station IV. from either side of the loch, opposite to where the soundings were taken, is under half a mile; the sides must therefore dip rapidly downward to form a deep, precipitous, sub-aqueous ravine. The drifting of the boat, though but for a short distance, by winds or currents during the time intervening between the one sounding and the other, would thus be quite sufficient to account for the difference in depth between the different soundings. The depth of the west portion of the loch was not tested, but the west end is probably comparatively shallow, if one may judge by the numerous islets at that end, and by the contour of the land contiguous to this part of the loch.

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* *Loc. cit.* † *Loc. cit.*

Specific Gravity and Temperature of the Bottom Water.

The self-locking water-bottle,* which was let down and touched bottom at 145 fathoms, as already stated, was when hauled up found to be perfectly closed, and filled with water mixed with impalpable mud. This mixture was emptied into a sufficiently large vessel, and when the mud had subsided the supernatant water was run off and tested by one of the set of hydrometers used on board the 'Garland.' The specific gravity registered by this hydrometer was 1007·9; temperature of water at the time the specific gravity was taken, 13·9° C. (57·2° F.) The temperature of the water at the bottom of the loch, taken with a 'Negretti-Zambra' deep-sea reversing thermometer, was 42° F.; at 100 fathoms the temperature was 49·6° F.; and at the surface, 57·7° F. The water, as in the case of many Highland lochs, was of a brown peaty colour.

Invertebrate Fauna.

The bottom mud brought up by the dredge and by the water-bottle at Station IV. was carefully examined, with the result that no living organism could be detected in it; a considerable portion of it consisted of fragments of Entomostracan tests that formed a distinct layer on the surface of the mud after it had been allowed to subside; it thus resembled very closely the mud from the bottom of Loch Ness. The loch was tow-netted in various places from Brinacory eastward to the head of the loch. The tow-net collections were chiefly made at the surface or at a depth of a few fathoms. On one or two occasions, however, the tow-net was attached to the dredge and lowered to a depth of from 50 to 100 fathoms. Entomostraca were found to be abundant at and near the surface, but were much fewer at 50 and 100 fathoms: the grouping of the species, however, appeared to vary very little in the surface and deep-water gatherings. A few gatherings were made by dragging the tow-net through the weeds in the shallow water at the head of the loch, and also close inshore at Brinacory—on the north side of the loch, near Brinacory island. Two days were devoted to the examination of Loch Morar, but the weather was not very favourable. On the first day there was almost continuous rain; the first part of the second day was rather better, but a smart westerly breeze sprang up shortly after noon, which caused the water to become choppy, and made rowing more exhaustive and difficult. Mr Anderson Smith accompanied us the second day, and but for his assistance and encouragement our success, small though it may be, would have been less.

Pelagic Entomostraca, though abundant in Loch Morar at the time of my visit, included comparatively few species, viz., two (or ? three) species of *Copepoda* and five of *Cladocera;* on the other hand, the bottom material, though comparatively poor in number of specimens, was rich in species, especially of *Cladocera,*—the number obtained in the bottom gatherings include eight species of *Copepoda,* five of *Ostracoda,* and sixteen of *Cladocera.* The apparent scarcity of the *Ostracod* group is noteworthy, and is probably attributable to non-suitability of habitat. The physical conditions of fresh-water lochs—as Loch Ness and Loch Morar, where the water is of great depth, and where the shores dip rapidly, leaving very little or no shallow margin—do not seem to favour the development of the *Ostracoda;* and it is interesting to compare in this respect the distribution of the marine species of the same group, which extends from the shore down to many hundreds of fathoms. Another point of interest may be noted here, viz., though several species of Copepoda were obtained, including one or two rare Harpactids, not a single *Canthocamptus* was observed,—not even *Canthocamptus minutus. Gammarus pulex*—the common fresh-water amphipod—was also conspicuous by its absence.

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* For description of this water-bottle, see *Sixth Annual Report of the Fishery Board for Scotland,* part iii. p. 316, pl. x. (1888).

Mollusca appeared to be very scarce: the only species observed were *Limnæa peregra* and *Pisidium pusillum.*

LIST AND DESCRIPTION OF SPECIES.

CRUSTACEA.

COPEPODA.

Family Calanidæ.

Genus *Diaptomus*, Westwood.

Diaptomus gracilis (G. O. Sars).

1863. *Diaptomus gracilus*, G. O. Sars, Oversigt af de indenlandske Ferskvands copepoder, p. 9.

1891. *Diaptomus gracilis*, Brady, Revis. Brit. Cyclop. and Calan., p. 29, Pl. XII. figs. 7–9; Pl. XII. figs. 1–8.

Of common occurrence all over the loch, but comparatively few of the specimens mature.

Family Cyclopidæ.

Genus *Cyclops*, Müller.

Cyclops viridis (Jurine).

1820. *Monoculus quadricornis viridis*, Jurine, Hist. de Monocles, p. 46, Pl. III. fig. 1.

1891. *Cyclops viridis*, Brady, *op. cit.*, p. 17, Pl. V. figs. 6–10.

Common all over the loch.

Cyclops serrulatus, Fischer.

1851. *Cyclops serrulatus*, Fischer, Bull. Soc. Imp. Moscow, vol. xxiv. p. 423, t. x. figs. 22, 23, 26–31.

1891. *Cyclops serrulatus*, Brady, *op. cit.*, p. 18, Pl. VII. fig. 1.

Frequent in bottom material collected at the head of the loch and at Brinacory.

Cyclops ewarti, Brady. (Pl. VI. figs. 1–10).

1888. *Cyclops ewarti*, Brady, Sixth Annual Report of the Fishery Board for Scotland, Part III. p. 232, Pl. VIII. figs. 1–10.

1891. *Cyclops ewarti*, Brady, Revis. Brit. Cyclop. and Calan., p. 22, Pl. VII. figs. 4–7.

Length 1·5 mm. ($\frac{1}{17}$th of an inch). Seen from the dorsal view, body elongate, pyriform, tapering gradually to the abdomen; first cephalothoracic segment equal in breadth to about four-fifths the length, and rather longer than the entire length of the other thoracic segments; forehead moderately broad, somewhat produced and truncate. Anterior antennæ slightly longer than the first thoracic segment, eleven-jointed, moderately stout, and sparingly setiferous; the fifth joint distinctly shorter, the first and seventh subequal and longer than any of the others. The formula shows very nearly the comparative length of the joints:—

$$\frac{23 \cdot 7 \cdot 12 \cdot 8 \cdot 5 \cdot 11 \cdot 22 \cdot 18 \cdot 11 \cdot 16 \cdot 19 \cdot}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8 \cdot 9 \cdot 10 \cdot 11 \cdot}$$

Posterior antennæ four-jointed, second and third joints smaller than the first and last. A long plumose seta springs from the lower distal extremity of the first joint; opposite to this, on the upper edge, are two short plain setæ: there is a small seta near the middle of the upper margin of the second joint, and on the upper margin of the third joint there is a row of small spiniform setæ arranged in a pectinate manner,—the setæ at the distal being much longer than the posterior ones; the extremity of the posterior antennæ bears a fascicle of setæ, one of which is longer and plumose; the second, third, and last joints are ciliate on the lower margin. The base of the mandible is provided with two long plumose and one very small plain setæ (fig. 4). Anterior footjaws short, four-jointed, the first being equal in length to the other three; the last is very small; the first joint bears three setæ, the second two, and the third and fourth one each. These setæ are furnished with short bristle-like cilia arranged somewhat widely apart; the fourth joint also bears two small terminal plain setæ (fig. 5). Posterior footjaw stout, well developed, four-jointed; the first joint bears two plumose setæ that arise from a papilliform process near the upper distal margin; a seta with bristle-like cilia springs from a conical base of the upper margin of the second joint, at the distal end of the same joint, two similar setæ arise from an elongate digitiform process; the upper part of the distal end of the third joint is produced so as to extend fully beyond the last two small joints, and terminates in a seta similar to those just described and a stout elongate spine (fig. 6). The basal joint of the fifth pair of feet is furnished with one stout seta plumose of the distal half; a long stout seta also plumose on the distal half springs from the end of the second joint; on the upper margin of the same joint, and near the base of the terminal seta, there is a fringe of stout cilia; and a short, moderately-stout spine, serrate on the interior edge, springs from the lower margin. The abdomen tapers very gradually; the posterior margins of the abdominal segments are fringed with small teeth; the last segment is considerably longer than the preceding one. Caudal stylets nearly one and a half times the length of the last abdominal segment. There is a small toothed notch on the outer margin near the middle of the proximal half of each stylet, and a small seta springs from near the middle of the lower half; the terminal setæ are plumose and of moderate length.

This species was first obtained in the upper reaches of the Firth of Forth in Nov. 1887; but though thus apparently a marine species, Dr Brady suggested that its real habitat might be 'in some of the streams or ponds 'whose contents find their way into the Forth.' The discovery of this species in Loch Morar—the second time it has been observed in Scotland—shows that the explanation of its occurrence in the Forth estuary suggested by Dr Brady is probably correct. *Cyclops ewarti* was of frequent occurrence in Loch Morar.

? *Cyclops Kaufmanni*, Uljanin.

1875. *Cyclops Kaufmanni*, Uljanin, Reise in Turkestan (Crust.), p. 38, t. xii., figs. 2–4.

1891. *Cyclops Kaufmanni*, Brady, Revision, p. 24, Pl. VII. fig. 3.

Several specimens of what appears to be this species were obtained in Loch Morar.

Cyclops fimbriatus, Fischer.

? 1785. *Cyclops crassicornis*, Müller, Entomostraca, p. 113, Pl. XVIII. figs. 15–17.
1853. *Cyclops fimbriatus*, Fischer, Bull. Soc. Imp. Moscow, p. 94, Pl. III. figs. 19–28, 30.
1891. *Cyclops fimbriatus*, Brady, *op. cit.*, p. 25, Pl. IX. fig. 1.

This pretty *Cyclops* was moderately frequent in the bottom material collected at the head of the loch.

Family HARPACTICIDÆ.

Genus *Attheyella*, Brady. (See note at p. 235.)

Attheyella spinosa, Brady. (Pl. VI. figs. 11–20.)

1880. *Attheyella spinosa*, Brady, Mon. Brit. Copep., vol. ii. p. 58, Pl. XLIII. figs. 15–18; Pl. XLVI. figs. 13–18.

Female as described by Dr Brady (*op. cit.*).

Male.—The third joint of anterior antennæ dilated exteriorly so as to form a large lobe-like process (fig. 23). Mouth organs and first and second pairs of swimming feet as in the female. Both branches of third pair of swimming feet three-jointed; the first two joints of the outer branches are broad and of about equal length, the second joint is armed on the outer half of the distal end with a strong conical spine slightly curved outward at the extremity, third joint narrow and as long as the other two together; the first two joints of the inner branch are very short, the second being armed with a moderately long spiniform process, the two edges of which instead of being straight are curved in a somewhat irregular zigzag manner; the last joint, which is nearly twice as long as the first two together, is furnished with a long plain terminal seta, besides a short and plumose subterminal one. Fourth pair as in the female. Fifth pair small; basal joint moderately broad, somewhat rounded, but not much produced posteriorly, and provided with two stout plumose setæ; secondary joint elongate-ovate, furnished with several setæ, as shown in the figure (fig. 18). Caudal stylets rather longer than, and not so much dilated as those of the female.

Attheyella spinosa was frequent in the bottom material from the head of the loch, and also in that from Brinacory. The large spines on the outer branches of the third swimming feet of the male form a striking character.

Attheyella cryptorum, Brady. (Pl. VI. figs. 21–31).

1868. *Canthocamptus cryptorum*, Brady, Jour. of Micros. Sci., vol. ix., Pl. VI. figs. 1–10.
1880. *Attheyella cryptorum*, Brady, Mon. Brit. Copep., vol. ii. p. 60, Pl. LII. figs. 1–18.

Length, exclusive of caudal setæ, ·66 mm. ($\frac{1}{38}$th of an inch). The general form is something like that of *Canthocamptus*. Anterior antennæ, of the female, short, moderately stout, eight-jointed. A sensory filament springs from the upper distal angle of the fourth joint. The proportional length of the joints are as follows:—

$$\frac{11 \cdot 11 \cdot 7 \cdot 7 \cdot 6 \cdot 8 \cdot 7 \cdot 10.}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8.}$$

The male antennæ are considerably dilated. There is a constriction between the third and fourth joints; the articulation between these forms a hinge to enable the antennæ to be used for grasping; the fifth joint is small, and bears a short stout spine on its upper distal angle, while the sixth joint is furnished with a sensory filament. First pair of swimming feet short, the outer branch three-jointed, the inner two-jointed, both, branches of about equal length, the basal joint of the inner branch stouter and rather shorter than the other; the margins of both joints are fringed with short spiniform setæ; the last joint bears at its distal extremity a moderately short plumose spine, and one short and one long bent subterminal seta; each of the three joints of the outer branch is armed exteriorly with a subterminal and somewhat stout plumose spine, the second joint carries a moderately long seta on the inner distal angle, while the last joint carries two terminal and one long bent subterminal setæ (fig. 24). Inner branches of the third pair scarcely longer than the first two joints of the outer branch, first joint very short; in the male the first joint bears a long stout setaform appendage, which is at least two and a half times the length of the inner branch; there is a small seta at the base of the appendage; the only armature of the second joint—which is somewhat lageniform—consists of two terminal plumose setæ, one being much longer than the other (fig. 27). Inner branches of the fourth pair shorter than the first two joints of the outer branch, first joint very small; the armature of both branches somewhat similar to that of the third pair (female). Fifth pair small, foliaceous; in the female the basal joint bears four long and two short plumose setæ; the long setæ are arranged as follows:—one on the inner and one on the outer margin near the somewhat truncate extremity, and two of them terminal, one of which is considerably longer than either of the other three; the two short setæ spring from the inner margin, as shown in the figure (fig. 29); the second joint is smaller, obliquely truncate, and provided with five setæ, as shown in the figure. In the male the basal joint is boldly convex, and bears two short plumose terminal setæ, second joint small subovate, furnished with one stout, coarsely plumose, and moderately long terminal seta, and two small setæ on the inner and three on the outer margin (fig. 30). Abdominal segments ornamented with two concentric rows of small prickles—one row near the lower and one near the upper margin, but the last row is not so conspicuous as the other. The opercular plate has the edge strongly aculeate. Caudal stylets short, somewhat dilated, and provided with two long terminal unequal setæ, one being about twice the length of the other, and a few short hairs (fig. 31).

This species was described by Dr Brady from specimens obtained by Mr Thomas Atthey, amongst gelatinous algæ growing on the roof of the pit-workings of the low main West Cramlington Colliery, near Newcastle, in 1868: so far as I can learn, it was not known to occur anywhere else till it was obtained in Loch Morar during our examination of that loch. Specimens were sent to Dr Brady, and he was able to recognise them as belonging to the species he had described from the West Cramlington Colliery.

It may be of interest to note here, that quite recently, when examining some material collected by hand-net in the vicinity of Harelaw Dam, Balerno, near Edinburgh, in August 1890, and which had not been examined previously for want of time, several specimens of this interesting species were observed, thus indicating that its distribution may not be so restricted as had been supposed. Its occurrence among the gelatinous algæ on the roof of the pit-workings at West Cramlington is very curious and interesting, and opens up questions respecting distribution of species which, like that of the 'toad in the rock,' may not be easily solved.

Attheyella propinqua sp. n. (provisional name), (Pl. VII. figs. 1–11).

Length, exclusive of caudal setæ, ·7 mm. ($\frac{1}{36}$th of an inch), anterior antennæ rather longer and more slender than those of *Attheyella cryptorum*, but resembling in this respect those of *Attheyella spinosa;* the relative length of the joints is also somewhat different, as shown by the formula—

$$\frac{7 \cdot 7 \cdot 6 \cdot 7 \cdot 6 \cdot 7 \cdot 7 \cdot 8.}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot 8.}$$

The secondary branch of the posterior antennæ is fairly well developed and two-jointed; the first joint bears one terminal seta, the second joint bears two plumose terminal setæ and a marginal one. The mandible, which is elongate and of moderate breadth, has a small two-jointed palp bearing a few setæ (fig. 5). Posterior footjaws two-jointed and armed with a slender terminal claw; the first joint is provided, at the inner distal angle, with a small spiniform seta. First pair of swimming feet short, inner branch rather longer than the outer, and composed of two nearly equal joints (fig. 7). The second, third, and fourth pairs similar to those of *Attheyella spinosa.* Fifth pair, especially in the female, somewhat like those of *Attheyella cryptorum;* those of the female rather larger than in that species; the basal joint is broader and subquadrate, and provided with shorter setæ on the subtruncate end; the second joint is broadly subovate, the outer margin bearing a fringe of cilia in addition to the five terminal and subterminal setæ. Fifth pair in the male smaller than in the male of *Attheyella cryptorum;* the extremity of the produced inner part of the basal joint is subtruncate and provided with two small plumose setæ, second joint ovate with one moderately long plumose and one short plain terminal setæ; there are also two short plumose setæ on the inner margin, and three short setæ on the outer margin. The second, third, and fourth abdominal segments are each furnished with one concentric fringe of short prickles close to the posterior margin, instead of two as in *Attheyella cryptorum.* Seen from the side, the abdomen terminates abruptly, with the fringed opercular plate projecting slightly upward and backward. The male differs little from the female: the anterior antennæ are not so stout as in *Attheyella cryptorum*, and do not possess the strongly developed lobe-like process, which is such a marked character of the male antennæ of *Attheyella spinosa;* the third pair of swimming feet are provided with shorter spines than the third pair of the male of *Attheyella cryptorum*, but are otherwise somewhat similar to those of that species; caudal stylets very short. In bottom material both from the head of Loch Morar and from Brinacory.

The species now described is somewhat intermediate between *Attheyella spinosa* and *Attheyella cryptorum*, but seems more closely allied to the latter; the three forms when placed together are readily distinguished from each other by the form of the abdomen and stylets. In the species now described, the abdomen, viewed laterally, is seen to end abruptly, with the opercular plate showing as a distinct tooth-like process; and the abdominal segments have only one fringe of setæ. In *Attheyella cryptorum*, the abdomen is more slender and ends much less abruptly than in the last species, the opercular plate is less prominent, and there are two rows of setæ on each of the abdominal segments; moreover, the ovisac is somewhat larger, so that the setæ of the fifth feet do not reach to the end of it as in *Attheyella propinqua.* In *Attheyella spinosa* the form of the stylets, which are larger than in either of the other two species, are very characteristic, as are also the curled setæ of the fifth feet. Dissection brings out other more or less important differences as shown by the description and figures.

Genus *Moraria*,* T. and A. Scott.

Ann. and Mag. Nat. Hist., ser. 6, vol. xi. p. 213, March 1893.

Anterior antennæ short, seven-jointed; inner branch of posterior antennæ, small, one-jointed; mandible palp, one-branched, two-jointed; posterior footjaws, three-jointed, provided with a prehensile terminal claw; first pair of swimming feet short; inner branches, two-jointed, not longer than the outer branches, joints subequal; inner branches of the second, third, and fourth pairs much shorter than the outer branches, two-jointed, joints subequal.

This genus somewhat resembles *Cylindropsyllus*, Brady, in form and in some structural details. In the form and structure of the posterior antennæ, mandibles, and first pair of swimming feet it resembles both *Attheyella cryptorum* and *Mesochra robertsoni*, Brady, but it differs very markedly from both *Attheyella* and *Mesochra* in the structure of the second, third, and fourth pairs.

Moraria anderson-smithi, T. and A. Scott. (Pl. VII. figs. 12–26).

1893. *Moraria anderson-smithi*, T. and A. Scott, Ann. and Mag. Nat. Hist., ser. 6, vol. xi. p. 213, Pl. VIII. figs. 1–14.

Length, exclusive of caudal setæ, ·62 mm. ($\frac{1}{40}$th of an inch). Forehead produced into a short rostrum. The anterior antennæ in both male and female are short, stout, and seven-jointed, the male antennæ being hinged between the fourth and fifth joints, and adapted for grasping. The relative length of the joints of the female antennæ are as follows:—

$$\frac{6 \cdot 8 \cdot 6 \cdot 5 \cdot 5 \cdot 7 \cdot 10 \cdot}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 \cdot 7 \cdot}$$

A stout sensory filament springs from the upper distal angle of the fourth joint in the female and the third in the male. From the same joint in the male there springs a curved spine-like process from a produced basal part. Posterior antennæ short, stout, three-jointed; a small one-jointed secondary branch springs from near the middle of the second joint. Mandibles well developed, having a broad biting part and a one-branched two-jointed palp. The maxillæ consist of a broad masticatory portion and a two-branched appendage; the truncate end of the masticatory portion is armed with five moderately long spine-like teeth; there is also a small seta on the exterior margin; the outer of the two branches of the appendage terminates in a comparatively stout spine, plumose on the outer half, and is also furnished with four small marginal setæ; the inner branch is small, and terminates in a small spine. Anterior footjaws stout, terminating in a stout clawed spine bearing a small seta on its outer margin near the base of the claw; slightly anterior to the claw are two digitiform processes, each of which terminates in a moderately stout spine and an inward curved process not so long as the spine, and bearing several small setæ on its interior distal margin. Posterior footjaws three-jointed; last joint small, bearing a moderately slender, but not very long terminal claw. A stout plumose seta springs from the interior distal angle of the first joint; inner margin of the second joint fringed with cilia. First pair of swimming feet nearly as in *Attheyella cryptorum*, but the last joint of the inner branch is shorter than the first joint, being scarcely three-fourths its length; it is also narrower, and bears a stout terminal spine and two subterminal setæ—one very short and one very long and slender. The second and third pairs of feet in the female are somewhat similar to those of *Mesochra lilljeborgii*, but the first joint is more dilated

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* From Loch Morar.

and rather longer than the last, and the whole inner branch is rather shorter than the first two joints of the outer branch. In the male the last joint of the inner branch of the second pair is much smaller than the first, and is armed with a long terminal spine and a subterminal seta; the first joint bears a stout conical tooth-like process, slightly hooked at the end on the outer aspect, and a seta on the inner margin. The fourth pair have the inner branches scarcely reaching to the middle of the second joint of the outer branches; the spines of the first and second joints are much longer than the joints to which they are attached; the inner of the three terminal spines of the last joint, is of considerable length, and, like the middle spine, is ciliate along one side. Fifth pair in both sexes somewhat similar to *Attheyella*, but the armature is shorter and stouter (figs. 25, 26). Caudal stylets about equal in length to the last abdominal segment. The abdomen in the male consists of five, in the female of four segments, the first and second segments in the female being coalesced.

Moraria anderson-smithi was obtained in gatherings of bottom material both from the head of the loch and from Brinacory; it appeared to be a rather scarce species in both gatherings, but was, if anything, more frequent in the last.

During our study of the closely allied genera,—*Attheyella*, *Moraria*, and *Mesochra*,—it seemed to us that the first and last of these, included species that differed considerably from each other. For example, *Attheyella spinosa* (including the male form) appears to belong to quite a different type from that of *Attheyella cryptorum; Attheyella spinosa* has both branches of the first pair of swimming feet three-jointed and of moderate length, while in *Attheyella cryptorum* the first pair is short, with the inner branches composed of two nearly equal joints. Moreover, in *Attheyella spinosa*, the male antennæ and the inner branches of the male third pair of feet, are strikingly different from those of *Attheyella cryptorum*. On the other hand, *Mesochra lilljeborgii* has the inner branches of the first pair elongate and two-jointed, the first joint being longer than the entire length of the outer branch; while *Mesochra robertsoni* has the first pair short, both branches of about equal length, and with the inner branches composed of two subequal joints, thus differing very distinctly from *Mesochra lilljeborgii*, but agreeing very closely with *Atheyella cryptorum* and with *Attheyella propinqua*. After summarising all the points in which the various species referred to agree and in which they differ, we are inclined to think that, while *Attheyella spinosa* and *Mesochra lilljeborgii* may be considered as the types of the genera to which they belong, the others, *Attheyella cryptorum*, *Attheyella propinqua*, and *Mesochra robertsoni*, form a distinct and closely related group, which if removed from the genera where they are at present located and included in a separate genus or subgenus, the systematic study of these various forms would be somewhat simplified.

OSTRACODA.

PODOCOPA.

Family Cyprididæ.

Genus *Cypria*, Zenker.

Cypria serena (Koch).

1838. *Cypris serena*, Koch, Deutchlands Crustaceen, H. xxi. 22.

1868. *Cypris lævis*, Brady, Mon. Rec. Brit. Ostrac., p. 374, Pl. XXIV. figs. 6–8.
1889. *Cypria serena*, Brady and Norman, 'Mon. M. and F. W. Ostrac. of the N. Atlantic and N.W. Europe, p. 70.

In bottom material from the head of the loch, rather scarce.

Cypria ophthalmica (Jurine).
1820. *Monoculus ophthalmicus*, Jurine, Hist. des Monocles, p. 178, Pl. XIX. figs. 16, 17.
1868. *Cypris compressa*, Brady, *op. cit.*, p. 372, Pl. XXIV. figs. 1–5; Pl. XXXVI. fig. 6.
1889. *Cypria ophthalmica*, Brady and Norman, *op. cit.*, p. 69, Pl. XI. figs. 5–9.

In the same material with the last, rather scarce.

Genus *Cyclocypris*, Brady and Norman.

Cyclocypris globosa (G. O. Sars).
1863. *Cypris globosa*, G. O. Sars, Om en i Sommeren 1862 foretagen zoologisk Reise i Christianias og Trondhjems Stifter, p. 27.
1868. *Cypris cinerea*, Brady, *op. cit.*, p. 374, Pl. XXIV. figs. 39–42; Pl. XXXVI. fig. 7.
1889. *Cypris globosa*, Brady and Norman, *op. cit.*, p. 71, Pl. XIV. figs. 1, 2; Pl. XI. figs. 10–18.

In bottom material collected at Brinacory, scarce.

Genus *Candona*, Baird.

Candona candida (Müller).
1785. *Cypris candida*, Müller, Entomostraca, p. 62, Pl. VI. figs. 7–9.
1889. *Candona candida*, Brady and Norman, p. 98, Pl. X. figs. 1, 2, 14–23.

In bottom material from the head of the loch, scarce.

Candona kingsleii (Brady and Robertson).
1870. *Candona kingsleii*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv. vol. vi., Pl. V.
1889. *Candona kingsleii*, Brady and Norman, *op. cit.*, p. 102, Pl. IX. figs. 19–22; Pl. XIII. fig. 19.

Also in bottom material from the head of the loch.

CLADOCERA.

CALYPTOMERA.

Family SIDIDÆ.

Genus *Latona*, Straus.

Latona setifera (Müller). (Pl. VII. fig. 27.)
1821. *Latona setifera*, Straus, Mem. Mus. d'Hist. Nat.

This curious Cladoceran was obtained very sparingly in a bottom gathering from close inshore at Brinacory. *Latona setifera* was first recorded as British by Conrad Beck in the *Journal of the Microscopical Society* for December 1883, and is there described and figured. Herrick, in *Crustacea of Minnesota* (1884), states that it 'is not yet recognised in 'Minnesota, but was found by Professor Birge in Lake Michigan.'

Latona is distinguished from other British Cladocera by, among other characters, the structure of the posterior antennæ. The inner branches of these appendages are two-jointed; the distal portion of the basal joint next the outer branch, is continued forwards in a leaf-like process to fully half the length of the second joint, as shown in the figure. The Loch Morar specimens were small—under 1 mm.—but the size appears to vary. Mr Conrad Beck states that specimens 2·5 mm. ($\frac{1}{10}$th of an inch) are often obtained.*

Family Holopedidæ.

Genus *Holopedium*, Zaddach.

Holopedium gibberum (Zaddach).
1855. *Holopedium gibberum*, Zaddach, Wiegman's Archiv. für Naturges., Bd. xxi. p. 159, Pl. VIII. fig. 9.

This remarkable species was common in Loch Morar, and especially so near the surface of the water. It appears to be widely, but perhaps not generally, distributed. In the Fishery Board's Ninth Annual Report there are records of its occurrence in Loch Ness, Loch Oich, and Loch Lochy, Inverness-shire. It is distinguished by the greatly elevated and hood-like form of the brood-pouch. They frequently measure over an eighth of an inch from the apex of the brood-pouch to the under side of the body. When seen adhering to the tow-net after being removed from the water, they closely resemble at first sight the little medusiform gonophores sometimes so abundant in the sea.

Family Daphnidæ.

It is noteworthy that no species belonging to this family were obtained in Loch Morar at the time of our visit.

Family Bosminidæ.

Genus *Bosmina*, Baird.

Bosmina longispina, Leydig.
1860. *Bosmina longispina*, Leydig.

This species was very abundant in Loch Morar. It is readily distinguished from *Bosmina longirostris* by its much greater size and by the larger postero-ventral spine-like processes of the carapace.

Family Macrothricidæ.

Genus *Macrothrix*, Baird.

Macrothrix laticornis (Jurine). (Pl. VII. figs. 28, 29.)
1820. *Monoculus laticornis*, Jurine, Hist. des Monocles, p. 151, Pl. XV. figs. 6, 7.
1850. *Macrothrix laticornis*, Baird, Brit. Entom., p. 103, Pl. XV. fig. 2.

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* C. Beck, *op. cit.*, p. 782.

This is a small species, being only about ·5 mm. ($\frac{1}{50}$th of an inch). It was obtained in the gathering of bottom material from Brinacory; only a few specimens were obtained. The figure represents an apparently adult form, and the post-abdomen.

Family LYNCODAPHNIA, G. O. Sars (1861).

Genus *Ilyocryptus*, G. O. Sars.

Ilyocryptus sordidus (Lievin).
1858. *Acanthocercus sordidus*, Lievin.
1861. *Ilyocryptus sordidus*, G. O. Sars, Om de i Omeg. af Christiania forekom. blad., p. 12.

A few specimens of *Ilyocryptus sordidus* were obtained in a gathering of bottom material from the shallow water at the head of the loch. It appears to be a moderately common species where the conditions are favourable, it was very common in June 1890 among vegetable mud on the south shore of Loch Leven, Kinross-shire; and in July 1892 by the side of Lochend Loch, near Edinburgh.

Family LYNCEIDÆ.

Genus *Eurycercus*, Baird.

Eurycercus lamellatus (Müller).
1776. *Lynceus lamellatus*, Müller, Zool. Dan. Prod., No. 3396.
1850. *Eurycercus lamellatus*, Baird, Brit. Entom., p. 124, Pl. XV. fig. 1.

A few specimens of this large and well-known species were obtained in the same gathering with the last.

Genus *Acroperus*, Baird.

Acroperus harpæ, Baird.
1835. *Lynceus harpæ*, Baird, Trans. Berw. Nat. Club, vol. i. p. 100, Pl. II. fig. 17.
1850. *Acroperus harpæ*, idem, Brit. Entom., p. 129, Pl. XVI. fig. 5.

This is not unlike *Camptocercus macrourus* in form, but much smaller. A few specimens only were obtained.

Genus *Camptocercus*, Baird.

Camptocercus macrourus (Müller).
1776. *Lynceus macrourus*, Müller, Zool. Dan. Prod., No. 2397.
1850. *Camptocercus macrourus*, Baird, Brit. Entom., p. 128, Pl. XVI. fig. 9.

This *Lynceid* is readily distinguished by the elongated narrow post-abdomen and *Acroperus*-like form of the carapace. Several specimens were obtained in bottom gatherings, both from the head of the loch and from the shore at Brinacory.

Genus *Alonopsis*, G. O. Sars.

Alonopsis elongata, G. O. Sars.
1862. *Alonopsis elongata*, G. O. Sars, Om de i Omeg. af Christ. forekom. blad., Andet Bidrag., p. 41.

Frequent in the same gatherings with the last.

Genus *Graptoleberis*, G. O. Sars.

Graptoleberis testudinarius (Fischer).

1851. *Lynceus testudinarius*, Fischer, Mem. de Lav. étrangers, St Petersbourg, vol. vi. p. 191, Pl. IX. figs. 3–6.

1862. *Graptoleberis reticulata*, G. O. Sars, op. cit., Andet Bedrag., p. 41.

1884. *Graptoleberis testudinarius*, Herrick, Crust. of Minnesota, p. 90.

The peculiar hood-like portion of the carapace that forms the head imparts a distinctive appearance to this species. It was very scarce in the Loch Morar gatherings, one or two specimens only being obtained in bottom material from the head of the loch.

Genus *Alona*, Baird.

Alona guttata, G. O. Sars.

1862. *Alona guttata*, G. O. Sars, op. cit., Andet Bidrag., p. 38.

This *Alona* was one of the more common of the smaller species in the gatherings of bottom material. The carapace viewed laterally is subquadrilateral in form, and the surface of the carapace is usually ornamented by being thickly covered with puncture-like markings. By means of the form and sculpture of the carapace the species is readily distinguishable among its more common associates.

Alona costata, G. O. Sars.

1862. *Alona costata*, G. O. Sars, op. cit., Andet Bidrag., p. 38.

In the same material with the last, but much scarcer. This species, though somewhat like the last, wants the peculiar puncture-like markings; it is rather longer in proportion to the breadth, and there are usually impressed parallel longitudinal lines observable on the carapace.

Alona quadrangularis (Müller).

1776. *Lynceus quadrangularis*, Müller, Zool. Dan. Prod., p. 199, No. 2393.

1850. *Alona quadrangularis*, Baird, Brit. Entom., p. 131, Pl. XVI. fig. 4.

In the gatherings of bottom material, but not very common.

Genus *Alonella*, G. O. Sars.

Alonella exigua (Lilljeborg).

1853. *Lynceus exiguus*, Lilljeborg, De Crust. in Scenia, p. 79, Pl. VII. figs. 9–10.

This is a very small species—rather less than the $\frac{1}{70}$th of an inch—but distinguishable by the broadly ovate form of the carapace, and the distinctly toothed posterior angle of the front margin. It appeared to be a scarce species.

Alonella nana (Baird).

1843. *Acroperus nanus*, Baird, Ann. and Mag. Nat. Hist., vol. ii. p. 92, Pl. III. fig. 8.

1862. *Alonella pygmæa*, G. O. Sars, *op. cit.*, Andet Bidrag., p. 52.

This was also apparently a rare species, but from its small size—less than the $\frac{1}{100}$th of an inch—it is easily overlooked. It is readily distinguished by the beautiful sculpture of the shell.

Genus *Peracantha*, Baird.

Peracantha truncata (Müller).
1781. *Lynceus truncatus*, Müller, Entom., p. 75, Pl. II. figs. 4–6.
1850. *Peracantha truncata*, Baird, Brit. Entom., p. 136, Pl. XVI. fig. 1.

This also was one of the rarer species, and, like the two previous forms, was only obtained in the gatherings of bottom material.

Genus *Leptorhynchus*, Herrick.

Leptorhynchus falcatus (G. O. Sars). (Pl. VII. fig. 30.)
1861. *Alona falcata*, G. O. Sars, *op. cit.*, p. 20.
1862. *Harporhynchus falcatus*, idem, ibidem, Andet. Bidrag., p. 41.
1884. *Leptorhynchus falcatus*, Herrick, Crust. of Minnesota, p. 114.

The long slender curved beak of this species (fig. 30) enables it to be readily distinguishable. It was of frequent occurrence in the bottom material only; both males and females were obtained. The beak of *Leptorhynchus falcatus* is said to exceed in length that of any known species of Lyncied. Norman and Brady* record it from 'Sweet-hope and Green Lee Lochs, Northumberland; Lochend Loch, Kirkcudbrightshire; and Lochmaben Castle Loch, Dumfriesshire;' and add, in 'all these localities it was numerically scarce.'

Genus *Chydorus*, Leach (1816).

Chydorus sphæricus (Müller).
1776. *Lynceus sphæricus*, Müller, Zool. Dan. Prod., No. 2932.
1816. *Chydorus mülleri*, Leach, Encyclop. Brit., Supp. Art. Annulosa.
1863. *Chydorus sphæricus*, Baird, Ann. and Mag. Nat. Hist., vol. ii. p. 89, t. 2, figs. 11–13.

Frequent, and only in gatherings of bottom material, both from the head of the loch and from Brinacory.

GYMNOMERA.

Family POLYPHEMIDÆ, Baird, 1845.

Genus *polyphemus*, Müller.

Polyphemus pediculus (Linné).
1746. *Monoculus pediculus*, Linné, Taun. Suec., No. 2048.
1776. *Polyphemus oculus*, Müller, *op. cit.*, No. 2417.
1850. *Polyphemus pediculus*, Baird, Brit. Entom., p. iii. t. xvii., fig. 1.

Taken in abundance with the tow-net, near the surface of the water, all over the portion of the loch examined.

Genus *Bythotrephes.*

Bythotrephes longimanus, Leydig.

This species was frequent in the surface tow-net gatherings; it was also obtained, though sparingly, in gatherings from fifty and one hundred fathoms, but probably some of the specimens may not have been obtained at the depths stated, but may have entered the net when it was being hauled up.

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* A Mon. of the Brit. Bosmin., Macroth., and Lynceidæ, p. 36.

Family LEPTODORIDÆ.

Genus *Leptodora*, Lilljeborg.

Leptodora hyalina, Lilljeborg.

This beautiful and interesting Cladoceran was frequent in some of the surface tow-net gatherings, but its extreme transparency when living enables it usually to escape observation, except by those who are more or less accustomed with the method of hunting for such organisms.

It will be observed from what has been stated in the foregoing notes on the results of my examination of Loch Morar, that this loch contains an abundant and interesting crustacean fauna which is well suited as a food supply for its numerous finny inhabitants. In this respect Loch Morar compares very favourably with Loch Ness, that somewhat resembles Loch Morar both in size and physical conditions. A partial examination of Loch Ness was made on two occasions during the summer of 1890,[*] when *Entomostraca* were found to be much less numerous than they were in Loch Morar in 1892. On the other hand, Loch Leven, Kinross-shire, which is a comparatively shallow loch, though covering a considerable area, and which was examined also in 1890,[*] closely resembled Loch Morar in the abundance of its crustacean fauna. There was of course some difference in the proportion and in the kinds of associated species, but this difference is of comparatively small importance when the organisms are considered from the utilitarian point of view of their value as a food supply for fishes, as almost all the micro-crustacea are of equal importance in this respect. Moreover, Loch Morar, like Loch Leven, is reputed to be a loch where the angler is almost certain of a good and successful day's fishing; but being so much out the way and so difficult of access, comparatively few anglers visit Loch Morar.

NOTE ON *Attheyella*, Brady (see page 225).

The following information was obtained after the preceding notes were in the press :—

G. O. Sars, in a paper entitled 'Oversigt af de indelandske Ferskvands-copepoder,' published in Christiania by Brøgger & Christie in 1863, described among other things three species of *Canthocamptus*, new to science, viz., *Canthocamptus crassus*, *Canthocamptus pygmæus*, and *Canthocamptus brevipes*, but without illustrative figures.

In 1883 Professor Lilljeborg exhibited a collection of crustacea at the International Fisheries Exhibition held that year in London. This collection, which included the three species of *Canthocamptus* here referred to, was secured by the Rev. A. M. Norman, F.R.S., and added to his extensive museum.

Through the kindness of Dr Norman, my son, Mr Andrew Scott, was recently favoured with an opportunity of examining Lilljeborg's specimens of Sars' *Canthocamptus*, and of comparing them with the description of

[*] See Part III. of the Ninth Annual Report of the Fishery Board for Scotland.

the species contained in the work of that author; and while doing so, he recognised a close resemblance between *Canthocamptus crassus*, G. O. Sars, and *Attheyella spinosa*, Brady, and between *Canthocamptus pygmæus*, G. O. Sars, and *Attheyella cryptorum*, Brady; a further examination tended still more to confirm the identity of the two species of G. O. Sars with the corresponding species described by Dr Brady.

Should my son's identification prove to be correct, the specific names adopted by Professor Brady will necessarily give place to those of Professor G. O. Sars, and in that case the nomenclature of the two species will stand thus:—*Attheyella* (*Canthocamptus*) *crassa* (G. O. Sars) = *Attheyella spinosa*, Brady. *Attheyella* (*Canthocamptus*) *pygmæa* (G. O. Sars) = *Attheyella cryptorum*, Brady.

The following is Professor G. O. Sars' description of the species referred to:—

(1) *Canthocamptus crassus*, G. O. Sars (*loc. cit.*, p. 23).

'Corpus quam in specibus ceteris robustus segmentis abdominalibus 'postice attenuatis in margine postico subtus et ad latera pilis vel aculeis 'sat longis pectenatim ornatis. Rami caudalis forma singulari fere ovati et 'ad basim valde constricti setis apicalibus brevibus er valde divergentibus; 'setæ intermediæ duoæ insolito modo flexuosæ in medio sparsim cilliatæ 'exteriore quam interiore triplo breviore. Antennæ 1 mi paris sat crassæ 'setis longis dense obsitæ. Ramus interior pedum 1 mi paris 3-articulatis 'exterior aliquanto longior in paribus sequentibus 3st brevissimus et 'biarticulatus. Pedum 5 ti paris articulus basilis introrsum parvum dilatatus et ut articulus ultimus setis longissimus præditus. Color albidus, longit circit $\frac{3}{4}$ mm.'

(2) *Canthocamptus pygmæus*, G. O. Sars (*loc. cit.*, p. 21).

'Corpus postice parum attenuatum segmentis abdominalibus sat crassis 'versus marginem posteriorem ad latera et subtus serie transversa aculeorum 'instructis. Rami caudales brevissimis latioris quam longiores setis 'majoribus apicalibus duabus sat divergentibus in medio aculeatis, 'exteriore dimidiam longitudinem interioris æquante. Operculum anale 'dentatum, dentibus majusculis. Antennæ 1 mi paris brevissimæ pedun'culo (articulis basilibus 4-composito) crasso flagello vero valde attenuato. 'Ramus interior pedum 1 mi paris exteriore paullo brevior ut in paribus 'sequentibus duobus biarticulatus, in pari 4 to unarticulatus minimus 'articulo 1 mo rami exterioris vix longior. Pedum 5 ti paris biarticula'torum, articulus 1 mus introrsum in processum foliiformen magnum et 'setiferum articulatum ultimum minimum et rotundatum longe superantem 'exit. Oculus minimus a margine antico capitis remotus saccus oviferus 'elongato-ovatus. Animal sat pellucidum colore plerumque albido interdum 'leviter rubicundo longit vix $\frac{1}{2}$ mm.'

The species provisionally described in this paper on the fauna of the Inland Waters of Scotland under the name of *Attheyella propinqua* may probably be identical with Sars' *Canthocamptus brevipes;* but as there are apparently one or two important differences between them, it seems better for the present to retain the specific name adopted in this paper.

EXPLANATION OF THE PLATES.

PLATE VI.

Cyclops ewarti, Brady.

Fig. 1.	Adult female, dorsal view,	× 50
Fig. 2.	Anterior antenna,	× 168
Fig. 3.	Posterior antenna,	× 126
Fig. 4.	Mandible and palp,	× 168
Fig. 5.	Anterior footjaw,	× 126
Fig. 6.	Posterior footjaw,	× 126
Fig. 7.	Foot of first pair,	× 168
Fig. 8.	Foot of fourth pair,	× 168
Fig. 9.	Foot of fith pair,	× 380
Fig. 10.	Abdomen and caudal stylets,	× 96

Attheyella spinosa, Brady.

Fig. 11.	Adult female, side view,	× 46
Fig. 12.	Anterior antenna, female,	× 336
Fig. 13.	Anterior antenna, male,	× 336
Fig. 14.	Foot of first pair,	× 253
Fig. 15.	Foot of third pair, male,	× 253
Fig. 16.	Foot of fourth pair,	× 253
Fig. 17.	Foot of fifth pair, female,	× 253
Fig. 18.	Foot of fifth pair, male,	× 336
Fig. 19.	Abdomen and caudal stylets, female,	× 126
Fig. 20.	Abdomen and caudal stylets, male,	× 126

Attheyella cryptorum, Brady.

Fig. 21.	Adult female, side view,	× 80
Fig. 22.	Anterior antenna, female,	× 506
Fig. 23.	Anterior antenna, male,	× 380
Fig. 24.	Foot of first pair,	× 253
Fig. 25.	Foot of second pair, male,	× 253
Fig. 26.	Foot of third pair, female,	× 253
Fig. 27.	Foot of third pair, male,	× 253
Fig. 28.	Foot of fourth pair,	× 253
Fig. 29.	Foot of fifth pair, female,	× 253
Fig. 30.	Foot of fifth pair, male,	× 380
Fig. 31.	Abdomen and caudal stylets,	× 100

PLATE VII.

Attheyella propinqua, n. sp.

Fig. 1.	Adult female, side view,	× 80
Fig. 2.	Anterior antenna, female,	× 253
Fig. 3.	Anterior antenna, male,	× 253
Fig. 4.	Posterior antenna,	× 506
Fig. 5.	Mandible and palp,	× 760
Fig. 6.	Posterior footjaw,	× 760
Fig. 7.	Foot of first pair,	× 336
Fig. 8.	Foot of third pair, male,	× 336

Fig. 9.	Foot of fifth pair, female,	× 336
Fig. 10.	Foot of fifth pair, male,	× 506
Fig. 11.	Abdomen and caudal stylets,	× 126

Moraria anderson-smithi, T. and A. Scott.

Fig. 12.	Adult female, dorsal view,	× 104
Fig. 13.	Adult male, side view,	× 104
Fig. 14.	Anterior antenna, female,	× 506
Fig. 15.	Anterior antenna, male,	× 506
Fig. 16.	Posterior antenna,	× 760
Fig. 17.	Mandible and palp,	× 760
Fig. 18.	Maxilla,	× 760
Fig. 19.	Anterior footjaw,	× 1000
Fig. 20.	Posterior footjaw,	× 1000
Fig. 21.	Foot of first pair,	× 760
Fig. 22.	Foot of second pair, female,	× 760
Fig. 23.	Foot of second pair—inner branch—male,	× 1500
Fig. 24.	Foot of fourth pair,	× 760
Fig. 25.	Foot of fifth pair, female,	× 1000
Fig. 26.	Foot of fifth pair, male,	× 1000

Latona setifera (Müller).

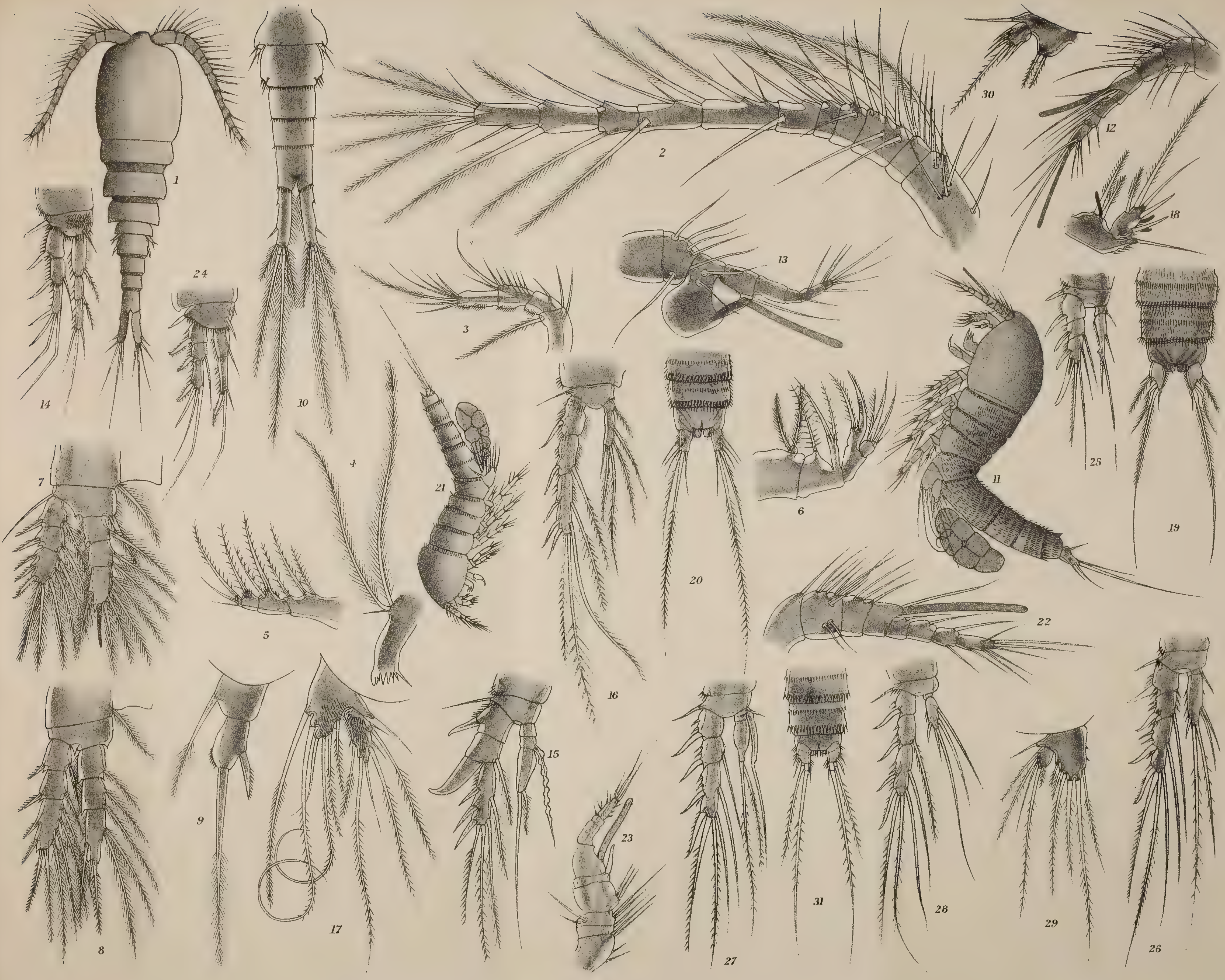
Fig. 27.	Second antenna,	× 80

Macrothrix laticornis (Jurine).

Fig. 28.	Adult, side view,	× 104
Fig. 29.	Post-abdomen,	× 190

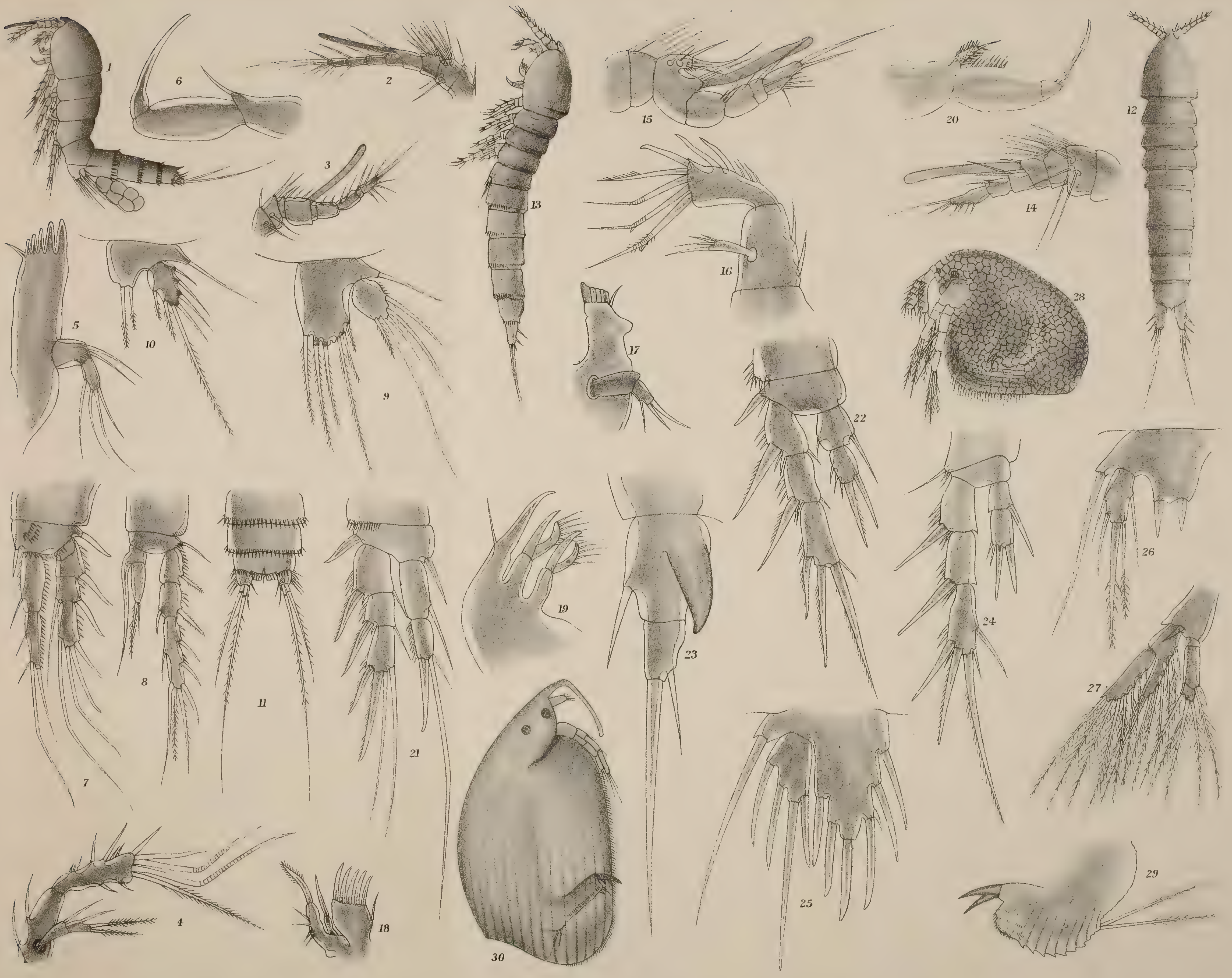
Leptorhynchus falcatus (G. O. Sars).

Fig. 30.	Adult female, side view,	× 128



Figs. 1-10.—Cyclops ewarti *Brady*. Figs. 11-20.—Attheyella spinosa *Brady*. Figs. 21-31.—Attheyella cryptorum *Brady*.

Andrew Scott, del. ad nat.



Andrew Scott, del. ad nat.

Figs. 1 11.—**Attheyella propingua**, *n. sp.* Figs. 13 26.—**Moraria anderson-smithi** *T. and A. Scott*. Fig. 27.—**Latona setifera** (*Müller*). Figs. 28 29.—**Macrothrix laticornis** (Jurine). Fig. 30.—**Leptorhynchus falcatus** (*G. O. Sars*).

IV.—CONTRIBUTIONS TO THE LIFE-HISTORIES AND DEVELOPMENT OF THE FOOD AND OTHER FISHES.

By Professor M'Intosh, M.D., LL.D., F.R.S., F.R.S.E., St Andrews Marine Laboratory. (Plates VIII.–XII.)

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1. On the Eggs and Larvæ of the Poor Cod (*Gadus minutus*).

Raffaele * briefly alludes to the eggs and larvæ of this species, which seems to be one of the most ubiquitous gadoids—ranging from the genial waters of the Mediterranean to the colder shores of the North Sea. He remarks that the egg agrees in general structure with that of the cod, but that the larva differs in the arrangement of the pigment. Marion,† again, found a large number of ova in the Gulf of Marseilles—on the 7th March—which he considered were those of the capelan (*Gadus minutus*), and he gives a figure of the larva. Mr Cunningham,‡ lastly, states that in April he found this species ripe, the diameter of the ova 1·02 mm., and the perivitelline space small. He did not hatch them.

For several years the spawning of the poor cod has been under consideration, but a more or less complete account has only been obtained recently. In 1884 and 1885 many ripe females were seen, but no ripe male was available at the same time. They were especially abundant in June 1885. By the care and skill of a fisherman at St Andrews (James Gourlay) numerous fertilised ova were brought from the fishing-grounds near the Bell Rock in June last year, so that the development could readily be followed. The nearly ripe ovarian egg (Plate VIII. fig. 1) has as usual a denser capsule, and, moreover, is wrinkled. Small vesicular masses are often seen on the surface of the yolk. Ripe ova fertilised at 9 a.m. on the 6th June were in the multicelled condition at 5·45 p.m., with a perivitelline space (Plate VIII. fig. 2). In diameter they varied from ·039 inch to ·0405 inch, or ·9906 mm. to 1·0287 mm.—sizes extending on both sides of the average given by Mr Cunningham. The temperature at this time was elevated, and it reached 70° on the 7th, so that development was quickened and considerable mortality ensued—indeed, the mere handling of the water containing them under the microscope killed the embryos, which were outlined

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* *Mittheilungen Zoolog. Stat. Neapol.*, viii. Bd., 1 Heft sep. abth., p. 36, tav. 1, fig. 25, et tav. 2, figs. 20, 21, 1888.

† *Annales du Musée d'Hist. Nat. de Marseille*, 'Zoolog.,' iv. p. 118, pl. 2, fig. 14.

‡ *Jour. Mar. Biol. Assoc.*, N.S., vol. i., p. 375.

(Plate VIII. fig. 3) and the optic vesicles indicated. The lip of the blastopore behind the embryo presented a peak or projection.

Another series procured in the open sea off Aberdeen by A. W. Brown, the laboratory attendant, and received on the 10th June, were mostly advanced. They ranged in size from ·9525 mm. to ·9906, so that they were somewhat less than the previous examples, the largest being those almost ready to hatch—indeed, some of the latter reached 1·0287 mm. in diameter. The eyes of the advanced embryos are silvery (their conspicuous condition is one of the characteristic features of the egg), and yellowish pigment is scattered over the head, body, and yolk.

A few were hatched on the 11th June. The larval poor cod somewhat resembles the whiting in coloration, and measures 2·3 to 2·4 mm. The eyes are silvery-greenish, and the entire body and head are dappled with minute yellow specks—invisible under a lens, but are seen by transmitted light under a low power of the microscope (Plate VIII. fig. 4). Black chromatophores occur along the ventral border of the muscle-plates, the tip of the tail alone being free. A less distinct series lies along the dorsal edge, and a few finely-branched specks occur on the head. The rectum terminates blindly at the posterior and upper part of the yolk. The latter seems to be comparatively large. Thus in a specimen with the tail slightly shortened (curved) the total length was 2·4 mm., while the yolk-sac from its anterior to its posterior border was 1·2 mm. (Plate VIII. fig. 5).

Five days after hatching (that is, on the 15th June in the case of those which escaped on the 11th), stellate black chromatophores appear on the yolk-sac and along the sides of the body, only terminating near the tip of the tail. The yellow chromatophores are also more evident on the yolk-sac. The otocyst shows a double border. The position of the rectum has altered little.

On the 16th June considerable advancement had been made (Plate VIII. fig. 6), though it was doubtful if the larvæ belonged to the same series. The increase in the ramifications of the stellate black pigment, the growth of the branchial arches, gill-slits, pectorals, and other parts is apparent; while the yolk has diminished. A more advanced example had, indeed, only a small portion of yolk, and the mouth was open, but the rectum had not moved downward to any extent. The black pigment is chiefly grouped along the abdominal roof and on the dorsal and ventral margins of the muscle-plates.

On the 18th June the yolk in some had quite disappeared. The mouth is widely open, though the jaw is rigid, unless under occasional spasms. The pectorals are large and fan-shaped, and are carried upwards. Even before reaching this stage (*i.e.*, before the yolk is quite absorbed) the larvæ swim on edge, resting afterwards on the bottom or the side. The eyes are silvery by reflected light, but have a gorgeous bronzed hue by transmitted. In the oldest examples the yellow colour seems to be less conspicuous, for it is present only on the head and anterior region—with a few specks on the pectorals, as represented in the specimen figured (Plate VIII. fig. 7). The increase of the black pigment over the abdomen is noteworthy. The circulation of the colourless blood is visible in the dorsal aorta and the cardinal veins. The swim-bladder is well marked. The young poor cod constantly darts about with open mouth, seldom resting more than a second or two, so that it is difficult to delineate.

At a slightly older stage (Plate VIII. fig. 8) the yellowish pigment had disappeared except on the cheeks, and the pectorals had increased in size. The marginal fin is slightly vesicular. They were comparatively delicate, and often perished if placed in water on a slide. A few survived till the 24th June without presenting any change worthy of note, except the appearance of a dorsal and ventral bar representing the shoulder-girdle.

2. ON A PECULIAR EXAMPLE (HYBRID ?) OF THE POOR COD (*Gadus minutus*).

A St Andrews fisherman, named Andrew Gordon, procured by a hook on March 24th a fish which puzzled him, and he sent it to the Laboratory. From its appearance he and others supposed it to be a hybrid between the whiting and the bib, or between the former and the poor cod.

The extreme length of the specimen was $7\frac{1}{2}$ inches, and the greatest depth $1\frac{5}{8}$ inch. In general outline (Plate XI.) it certainly somewhat approached the whiting, though the dusky bronzed pigment of the dorsum and dorso-lateral regions, the somewhat coarser scales, together with the shape of the head, the presence of a barbule, and the condition of the pelvic fins leaned to the poor cod. Yet it differed distinctly from the latter in general aspect, and in the much more silvery infero-lateral regions and abdomen.

In regard to the shape of the body and the course of the lateral line it most nearly approached the poor cod, though it was more elongated. Moreover, the curve of the lateral line kept at a nearly uniform height, or even with a tendency upward till beyond the tip of the pectoral, and the downward curve was decidedly more abrupt. It differed in this respect not only from the poor cod, but from the whiting and the bib. This curvature may be related to the marked fall in the dorsal outline from the posterior border of the first dorsal fin to the middle of the second. It was not connected with any abnormality of the vertebral column.

The fins agreed more or less with those in the whiting, the first dorsal especially differing from that in the poor cod and bib, and corresponding rather with that of the whiting, since it was much less acutely triangular and elongated. It possessed 14 rays (Day attributing from 12–15 to the poor cod). The second dorsal corresponded more or less with that in the last-mentioned species, and it had 22 rays (Day 19–25). The fin-rays, however, were less uniform. The third dorsal had 25 rays (Day 17–22), and it resembled that in the poor cod. The first anal commenced in a line with the posterior border of the dorsal, and extended slightly beyond the commencement of the third dorsal. The longer rays anteriorly and its general shape approached the condition in the poor cod. It had 27 rays (Day giving 25–29). A vertical line from the posterior border of the first dorsal touched the commencement of this fin, whereas in the whiting a considerable portion of the first anal is in front of the line. The second anal had 26 rays (Day 25–29).

The caudal had a somewhat larger 'bite' in the middle than in the usual examples, and had 30 rays (Day 26). The pectorals require no special remark, except that the black spot at the base was more pronounced than in the poor cod, but corresponded neither with the bib nor the whiting, being less distinct than in the former and larger than in the latter. It proceeded to about the middle of the base instead of being confined to the region above the base. There were 18 rays in the pectorals (Day 13–16). The pelvic fins agreed with those of the poor cod, each having 6 rays.

The snout when viewed from the dorsum was considerably narrower than the average examples of poor cod of the same length. In profile, again, the head was more elongate, the mandible especially differing, since it projected in front beyond the premaxillaries. The eyes were considerably smaller than usual, and the loose corneal covering was less developed. The barbel was comparatively small.

The specimen was a female, with the ovaries even more advanced than in an average example of the species, and it would certainly have spawned this season. The ova ranged from ·3810 mm. to 1·1430 mm.

The teeth differed from those of the ordinary examples of the poor cod and the bib, being nearly uniform—that is, the larger teeth of the outer row, usually so characteristic, were not distinctly differentiated. They diverged still further from the teeth of the whiting. There were 37 gill-rakers in the outer gill, 24 in the next, 23 in the third, and 18 in the inner—all thus diverging from the average condition in the poor cod.

On the whole, the differences warrant notice, especially as these became even more marked after preservation in spirit. Instead of the pale brownish and somewhat loose wrinkled skin of the dorsum and lateral regions of an ordinary preparation, this presented slightly darker pigment on a smoother surface (smaller scales). The region below the lateral line was also much smoother, and, moreover, the firm surface had a sheen as silvery as in the whiting.

3. On the Eggs of the Coal-Fish, Green Cod, or 'Saithe' (*Gadus virens*).

Last year* a few remarks were made on some unfertilised eggs of this species forwarded from Shetland, but unfortunately they were in an indifferent condition. Continued exertions were made by Dr Fulton and the staff this season, so that further progress has been made. Thus, on the 24th January the laboratory attendant proceeded to sea in a long-line fishing boat from Anstruther, and had an opportunity of examining 4 specimens—3 males and 1 female. All the males were ripe, the sperms being sent out as a white jet for a few seconds as they lay on deck. The most advanced female was brought to shore—length, 3 feet 6 inches; weight, between 25 and 30 lbs. The ovaries were much enlarged, but by no means ripe, the average size of the largest ova being from ·6096 mm. to ·7620 mm.

A little later the same man joined the 'Faith,' a steam-trawler, which proceeded about 200 miles from Aberdeen and about 90 miles S. or S.E. of Shetland. Though in the three hauls about 190 boxes of fishes, chiefly haddock and cod, were obtained, only 1 ripe male green cod was trawled. On the 16th March, however, a ripe female was secured in Aberdeen fish-market, and the ovaries forwarded to St Andrews. They were characterised by the great thickness of the ovarian wall, so that at first sight they resembled those of the wolf-fish—more especially as they were also connate. In section the wall seemed to have a well-marked circular coat, then a thick layer of longitudinal fibres, followed by a somewhat mixed inner series, chiefly circular, but also containing numerous longitudinal fibres.

The ripe female fish, as in the cod, pollack, and some others, has a prominent belly—a feature specially noted by Mr Holt in this species.

A considerable quantity of ripe eggs were present in this specimen, though unfortunately their condition was unsatisfactory. Their diameter, 1·2573 mm. to 1·2954 mm., would seem to indicate that they had been dead for some days, and more or less distended.

A more successful effort was, however, soon made by Mr R. Duthie, Assistant Fishery Officer at Lerwick, whose perseverance in such work deserves special commendation. On the 31st March he fertilised a series of ova at 4 P.M. in Shetland, and transmitted them to St Andrews. At 6 P.M. on the 3rd April all seemed to be dead, but a careful survey of the vessels revealed some living eggs on the bottom. These measured 1·0287 mm. in diameter, whereas others from the same fish, imperfectly preserved in weak picric and spirit, had a diameter of 1·1430 mm. The general appearance of the egg resembled that of the cod, and the micropyle agreed with that of the haddock figured in the 'Researches.' The blastopore was still open (Plate IX. fig. 1), and the optic vesicles formed. The perivitelline space varied in size.

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* *Tenth Annual Report*, Part III. p. 286.

On the 4th April the blastopore had closed, with radiate streaks (Plate IX. fig. 2), and Küpffer's vesicle had formed. The muscle-plates are defined and the notochord more evident. The yolk presents a faintly granular aspect, it may be from indications of the future pigment-corpuscles. The pectoral folds are large, and show many granules.

The radiate strands from the pectoral region had become very distinct on the 6th April, and black chromatophores had appeared over the yolk, while indications of similar pigment were present along the body (Plate IX. fig. 3).

The black chromatophores had generally increased on the 7th April, though there were variations in this respect, as shown in the figures of this date (Plate IX. figs. 4 and 5). These eggs remained on the bottom of the vessel, but retained vitality.

Next day (8th) the sides of the embryo had a series of conspicuous black chromatophores, these also being present over the yolk. The tip of the tail now reached the head. The arrangement of the pigment thus evidently differs from that in the cod, and foreshadows the more general distribution of the chromatophores, so characteristic of the species in the young condition.

One hatched on the 9th April, but had died before Mr J. M. Anderson, to whom I am indebted for sketches during my absence, could figure it. Another, partially hatched, is figured in Plate IX. fig. 7; its vitality having failed before complete extrusion occurred. The distinctive points referred to are clearly seen in this advanced specimen.

Mr Holt examined a ripe female, from the Great Fisher Bank at Grimsby, on the 6th of February this year, but the eggs were all dead and more or less altered, some being spherical, others ovoidal.

It is remarkable that so few opportunities of seeing the fertilised ova of this species have occurred, and yet it is a common form on both eastern and western coasts.

4. On a Small Egg resembling that of the Dab.

For some years a small egg closely resembling that of the dab has frequently been found at the surface in June. Its diameter, however, is considerably smaller than that usually attributed to the dab, viz., from ·6858 to ·7620 mm., whereas the egg of the dab at St Andrews is generally from ·8382 to ·8763 mm. Mr Cunningham gives ·84 mm., and Professor Prince and the author in the 'Researches' stated it as ·825 mm. The examination of these small eggs during development would seem to show that they closely resemble the eggs of the dab. In order to supplement what is stated and figured in the 'Researches,' it may be well to give a brief outline of the conditions in these specimens, which last summer abounded at the surface of the water both in St Andrews Bay and in Aberdeen Bay. The early forms procured in the tow-nets had the embryo about half round the yolk (Plate X. fig. 1), only a very faint yellowish tint being present. Somewhat later (Plate X. fig. 2) the yellow pigment-spots form a distinct double band, and the eggs are soon conspicuous in the water from its further development.

The larval fish (Plate X. fig. 3) resembles the dab most closely, having only yellow pigment scattered on the head and in a double line along the trunk. The larvæ often float on the surface of the still water with the yolk-sac uppermost. A thin strand connects the rectum with the edge of the marginal fin, but there is no anus. A pair of sense-organs occur a little in front of the vent, and three pairs behind. In one an ovoid oleaginous mass moved freely in the yolk (Plate X. fig. 4), and a few small oil-globules rested on this mass, as often seen on the oil-globules of other species. They are delicate, the larvæ perishing from elevation of temperature, or the yolk bursts from the sac and glides away as a transparent oily mass.

Some, hatched on the 13th June, lived till the 21st (Plate X. fig. 5), and they differed from those figured by Professor Prince in the absence of the crescents of lemon-yellow pigment on the dorsal marginal fin. They are very active little fishes, with silvery eyes and bright yellow pigment. They progress in certain cases chiefly by the vibratory action of the pectorals, scarcely a trace of lateral or other movement being visible. Black chromatophores are now present along the body, the yellow forming a conspicuous dorsal and ventral series. About the posterior third of the body groups of yellow spots occur in both dorsal and ventral marginal fins, and in some a few yellow chromatophores pass further forward, close to the margin of the muscle-plates. While the eyes are silvery by reflected light, they are bluish-green by transmitted light. One example presented a large hydropic swelling over the head, such as Professor Prince figures in Plate XVI. fig. 3 of the 'Researches.'

It is interesting, therefore, if the above interpretation be correct, to find considerable variation in the size of the eggs of this common species. Moreover, it is clear that the development of the pigment—for instance, that in the dorsal marginal fins—is retarded in certain instances.

5. Further Remarks on the Eggs of the Halibut.

The ripe females of this species seem to have been met with chiefly towards the end of April and beginning of May, as the remarks in the *Tenth Annual Report* (p. 285) indicate. This year Mr R. Duthie, Assistant Fishery Officer, Lerwick, whose zeal I have formerly commended, procured, from Bergen Bank, on the 5th May a quantity of ripe eggs of this form. He observes in a note forwarded with the eggs,—'The halibut roe was 'in fine condition, about half a gallon (apparently) of perfectly ripe ova 'having been obtained out of a fish about 22 lbs. in weight. The crew 'who brought it ashore are not fishing regularly, and did not know its 'value. When they saw ripe eggs running from the fish they opened the 'halibut and removed the roe. I did not get it till the following day, 'and of course all attempts at fertilisation failed.'

The examples forwarded in the fresh as well as in the preserved condition showed that in the recent specimens the capsule (*zona radiata*) is of considerable toughness. All bear lifting with the forceps freely, and it is evident that those examined last year by Mr Holt and myself had become considerably softened by maceration. Captain Dannevig tells me that the Norwegian examples are also tolerably tough, and bear handling freely.

The diameter of the fresh as well as of the preserved eggs agreed with that published last year, viz., from 3·0861 to 3·8 mm. Most of those in the solution were ruptured at one point.

The size of the ripe fish is interesting, for a halibut of 22 lbs. is a comparatively small fish, the present example being about 4 feet long.*

I have included this form under the pelagic eggs, both from its appearance and structure; but since it has never been obtained in a townet in the neighbouring seas, it is possible it may be less buoyant than the smaller eggs.

6. On an Unknown Egg, measuring 1·3335 mm., and a Larva with much Yellow Pigment.

Early in June 1892, a comparatively large pelagic egg, measuring 1·3335 mm.,—that is to say, about the size of the egg of the haddock,—was procured by the laboratory attendant 160 miles E. by N. of Aberdeen (Pl. X. fig. 6). The embryo was well advanced on the 11th, and was tinted yellowish from the chromatophores. A few finely ramose black specks also occurred on the yolk.

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* As in other forms the size of the ripe males is considerably smaller, some weighing only fourteen pounds or even less. Moreover, the males seem to arrive at maturity somewhat earlier in the season than the females.

The following day the yellowish pigment was more abundant, and the yolk somewhat less. The pectorals are budding out, and a large Küpffer's vesicle appears, though the tail has a broad marginal fin and extends much beyond the yolk, which has a few yellow chromatophores. Minute black specks occur amongst the yellow in the caudal region. The otocysts have two otoliths. The egg-capsule (*zona radiata*) shows very faint wrinkles, much less marked than in the lemon-dab.

The larval fish has numerous yellow chromatophores over the head, body, and tail, with a few on the yolk-sac (Pl. X. fig. 7), and minute black specks are also present. The otocysts are small.

The relationships of this form are at present unknown.

7. ON AN UNKNOWN PELAGIC EGG WITH A CONSIDERABLE PERIVITELLINE SPACE AND A YELLOWISH EMBRYO.

In the same area, 160 miles E. by N. of Aberdeen, an egg (Pl. X. fig. 8) varying from 1·2192 mm. to 1·2954 mm. was obtained the second week in June, the embryo on the 12th having the tail slightly free from the yolk, and with yellowish chromatophores generally distributed.

The proportionally large size of the embryo is noteworthy (Pl. X. fig. 9), and well seen in a lateral view. A few yellow chromatophores are also present on the yolk. On the 12th no action of the heart had yet occurred.

The embryos (Pl. XII. fig. 3) which were hatched on the 16th June are about 3 mm. in length, or slightly less. The head, body, and yolk-sac are marked with bright gamboge-yellow chromatophores, and the dorsal marginal fin, especially about its middle third, has many pigment-corpuscles of the same colour, while some also appear on the ventral marginal fin. A few finely ramose black chromatophores are scattered over the yolk-sac. The eyes have only yellow pigment, which is arranged in a somewhat radiate manner. The notochord is multicolumnar. The rectum is near the margin, but is still occluded. In the specimen figured a clear vesicle lay under the trunk above the yolk-sac.

One larval fish remained alive till the 19th June (Plate XII. fig. 4), but the trunk was curved. The pectorals had much increased in size, and the yellow pigment was more abundant on the head and other parts. A broad band of the same pigment occurs on the ventral surface of the yolk, a patch on the body just behind the yolk-sac, two others on the caudal region, while at the tip of the tail, which is curved in the sketch, are two patches of the same colour. The only black pigment visible is a slight ring round each lens. An air-bladder seems to be developed.

8. ON AN EGG 1·2954 MM. IN DIAMETER, WITH AN OIL-GLOBULE ·1905 IN DIAMETER.

Likewise from the foregoing area comes an egg of 1·2954 mm. in diameter (Pl. IX. fig. 8), with an oil-globule ·1905 in diameter,—that is, somewhat larger than the egg of the mackerel, which Cunningham gives as 1·22 mm. The zona is very delicate, and the micropyle a simple depression. The yolk presents a finely reticulated surface (from the blastoderm — as in the long rough dab?). The spaces are slightly hexagonal, and somewhat resemble the cortical yolk-segments of *Solea lutea.* They seem to be genuine reticulations, but they may be only superficial, or in a double line round the yolk. The oil-globule had a few small spheres of oil attached to it, and is pale under a lens, but assumes a smoky hue under the microscope.

9.—ON AN UNKNOWN LARVAL FISH HAVING ONLY BLACK PIGMENT.

Amongst the larvæ which had hatched in the collection of eggs forwarded from the fishing-ground 160 miles off Aberdeen (E. by N.) was a form having a peculiarly elongated caudal region, and finely ramose black pigment on the head, body, and tail (Pl. XII. fig. 5). The marginal fin appears to be somewhat narrow.

This form was not discriminated till it had emerged, so that the egg presented no peculiarity. Mr Holt states that the larva of the pollack has only black pigment, but very little seems to be known of this species.

10.—ON THE SPAWNING PERIOD OF THE POLLACK.

Last year Mr R. Duthie, Assistant Fishery Officer, procured ripe eggs of this species on the 7th May,* and this year the same active officer found ripe eggs in a fish caught 20 miles east of Lerwick, Shetland, on the 5th May. The ova were received at the laboratory on the 8th, partly in sea-water and partly in solution. The diameter of those in the water was 1·2954 mm., but they were not in a satisfactory condition. In the solution (made by a local chemist) they ranged from 1·0668 to 1·1430 mm.

11.—FURTHER REMARKS ON YOUNG PLEURONECTIDS, INCLUDING THE TURBOT, BRILL, AND TOPKNOT.

The capture in a tow-net during the night of the 23rd June 1893, by the laboratory attendant (A. W. Brown) of a young *Rhombus* (turbot-like), 10 mm. in length, and at a stage differing from anything hitherto available, affords a further opportunity for again referring to the younger stages of the sinistral forms mentioned above, and of clearing up certain obscurities in which they are at present involved.

The specimen (Pl. XII. fig. 6) measures fully 10 mm. in total length, but its breadth cannot be accurately given, since the tips of the fin-rays are considerably injured, and the ventral edge lacerated from the hyoidean region to the middle of the anal fin. In life it much resembled a young flounder in colour, and was difficult to detect; indeed, the attendant lost it in the jar, and only recovered it after death had made the tissues more opaque. When it reached the laboratory, it was more or less in the latter condition, with a slightly yellowish hue of the body, which, with the head, was dotted all over with large and small black chromatophores. The dorsal fin had six black touches, and portions of two were present in the anal, which, as already mentioned, had been injured. The most distinct of these touches began at the finely-dotted line of black pigment at the inner border of the interspinous bones, and proceeded distally into the fin-rays almost to the tip. The pigment on the head was irregularly scattered, and the same may be said of that on the body, though, in the case of the latter, the larger chromatophores are observed to be densest in two longitudinal streaks, in the upper half of the region. The eyes are large and silvery, while the great size of the head, the structure of the mouth, and the hyoidean region are diagnostic. The head, indeed, is so large that it is only about a fifth less than half the diameter of the entire animal to the posterior border of the hypurals. Minute spines occur along the opercular border and a portion of the surface inferiorly, above the eyes and elsewhere over the snout. Such spines are characteristic of the somewhat later stages of the turbot (Pl. XII. fig. 7) at the length of 14 mm., in which the opisthure is still very evident at the upper border of the caudal, and also in a slightly older specimen figured in the 'Marine Invertebrates and Fishes of St Andrews' (Pl. VI. figs. 5 and 6), but whether they are also present in the young brill of similar stages is still an open question. It is probable that they are present.

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* *Tenth Annual Report of Fishery Board for Scotland*, Part III. p. 288.

Another specimen 15 mm. long was captured in St Andrews Bay in the bottom tow-net on 11th July 1893. The eye is fully further over than in the Plymouth specimen of the turbot formerly referred to (10th Report), with which it agrees in regard to the spines on the pre- and sub-operculum, and, moreover, a few minute ones occur along the mandible. The head, however, seems to be proportionally large. The dorsal fin has seven touches of dark pigment, and the anal four distinct touches and a small patch opposite the seventh dorsal. The fin-rays seem to agree more closely with the brill than the turbot. Moreover, the fins do not show the general dusting of pigment characteristic of the Plymouth example, and therefore the fish rather corresponds with Raffaele's drawings of the brill. The spines on the pre- and sub-operculum of the Plymouth example (turbot) are also larger.

So far as can be observed, both of the foregoing closely resemble young brill, and therefore diverge from the species with the otocystic spines mentioned last year; and figures of Irish examples of which, with descriptions—in proof—I have had the privilege of examining, through the courtesy of Mr Holt. The latter author is still inclined to link them on to the brill, but their absence from St Andrews Bay and neighbourhood, and the presence of one or two older forms from such areas as the Moray Firth, together with the fact that specimens of the above-mentioned kinds are more abundant, and agree more closely with the condition in the brill, incline me to the opinion already expressed.

Having received from Mr Holt a series of small deeply-pigmented post-larval 'turbot,' further facts have been elicited. The smallest is a little over 6 mm. (6·3), and the others approach the example figured last year (Pl. XIV. fig. 9), and captured on the 11th July 1890. The body has, however, considerably increased in depth, and the increase in the finely branched black chromatophores gives the body a dusky appearance. The opisthure is well marked, the true caudal rays beneath are developing, and minute spines occur on the pre- and sub-operculum. The pectorals are large, but no ventrals are visible. A stage very little older (larger) shows the same soft spines over the eyes, and generally on the cheeks (opercular region). The eyes are strictly lateral in position. At 8 mm. the eye shows no change, and the spines are similar. The opisthure is coalescing with the upper edge of the caudal. The black pigment gives the body a tesselated appearance. The longest is 9 mm., with the caudal well formed, and the opisthure amalgamated. The spines on the cheeks and on the eyes are well marked. True rays have appeared in both dorsal and anal fins.

On comparing the foregoing with the form represented in Pl. XII. fig. 6, and which is 10 mm. long, with Mr Holt's largest example at 9 mm., it is found that the difference in regard to the degree of development is great, the opisthure in the little English example being amalgamated with the caudal, whereas in the larger Scotch specimen it is still more or less separate. The fin-rays, moreover, are greatly in advance of the smaller specimen in all the fins. The question, however, arises as to whether the specimen figured is normal.

The stage of the *Rhombus*, represented in Pl. XII. fig. 6, differs very considerably from any figured by Raffaele,* from the somewhat indistinct representation by Möbius and Heincke, and from the figure given by Cunningham in his work on the Sole (a similar stage to that figured by Mr Masterman). It also is in contrast with all the young stages alluded to in previous descriptions, as summarised in last year's remarks on the group, and shows that those procured S.E. of the Isle of May in the 'Garland' (22 fathoms ground, where the Isle of May bears N.W. by 8 miles), and which were also obtained off the West Coast of Ireland (Donegal) by Mr Holt, and the somewhat older stages from St Andrews, and from the Moray Firth, as well as the smaller forms, having very prominent otocystic spines and ventral pigment-lines, also from the West Coast of Ireland, are wholly different.

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* *Op. cit.*, tav. 4, figs. 8, 11, and 15.

The former, viz. those described in the *Researches* (pp. 845 and 846), and figured in last year's Report (Pl. XIV. figs. 7, 10, and 11), seem to connect themselves with the topknot, the most common species of which in this neighbourhood is *Zeugopterus punctatus.* The numbers, if this supposition be correct, at this stage of growth, viz., from 4·5 to 9 mm. long, form a characteristic contrast to their paucity at subsequent stages (*i.e.*, adolescent or adult), when a single example at intervals is all that is usually seen of them. As mentioned in last year's remarks, they belong to a smaller fish than the turbot, both from the progress made by the eye on the ridge in relation to the comparative size of the body, the condition of the fin-rays, the small size of the eye, and other points.

Further, it is possible that such forms as that figured in the *Researches* by Professor Prince (Pl. XIX. fig. 1) may be a further stage of the same species (topknot), the diminution in the size of the eye being due to changes accompanying growth, or occasionally to abnormality. The appearance of spines over the otocyst (as in Pl. XIV. fig. 14, of last year's Report) is a feature which probably occurs when the eye is near or on the ridge, and which apparently disappears when the eye is quite round. The number of the fin-rays, as shown last year, approaches the condition in the topknot, and the same remarks apply to Mr Holt's Irish forms.

The series then connected with the turbot (and brill?) commences with Pl. XIV. fig. 9 of the Tenth Report, is followed by that recently procured (Pl. XII. fig. 6), and the next stage is given in fig. 7 of the same Plate, the last an undoubted turbot. This links on to the small turbot of 40 mm., obtained in seine-nets used inshore.

EXPLANATION OF THE PLATES.

Plate viii.

Fig. 1. Unripe egg of the poor cod, dotted over with yolk-vesicles, and the capsule marked by wrinkles, 3rd June 1892. × 57.

Fig. 2. Egg of the same species in the multicelled condition, 8½ hours after fertilisation, on June 6th, 1892. × 57.

Fig. 3. The same egg 24 hours later, viz., between 4 and 5 p.m. on the 7th June. A distinct peak is visible in the lip of the blastopore behind the embryo. × about 40.

Fig. 4. Larval poor cod on emergence, 11th June 1892. × 26.

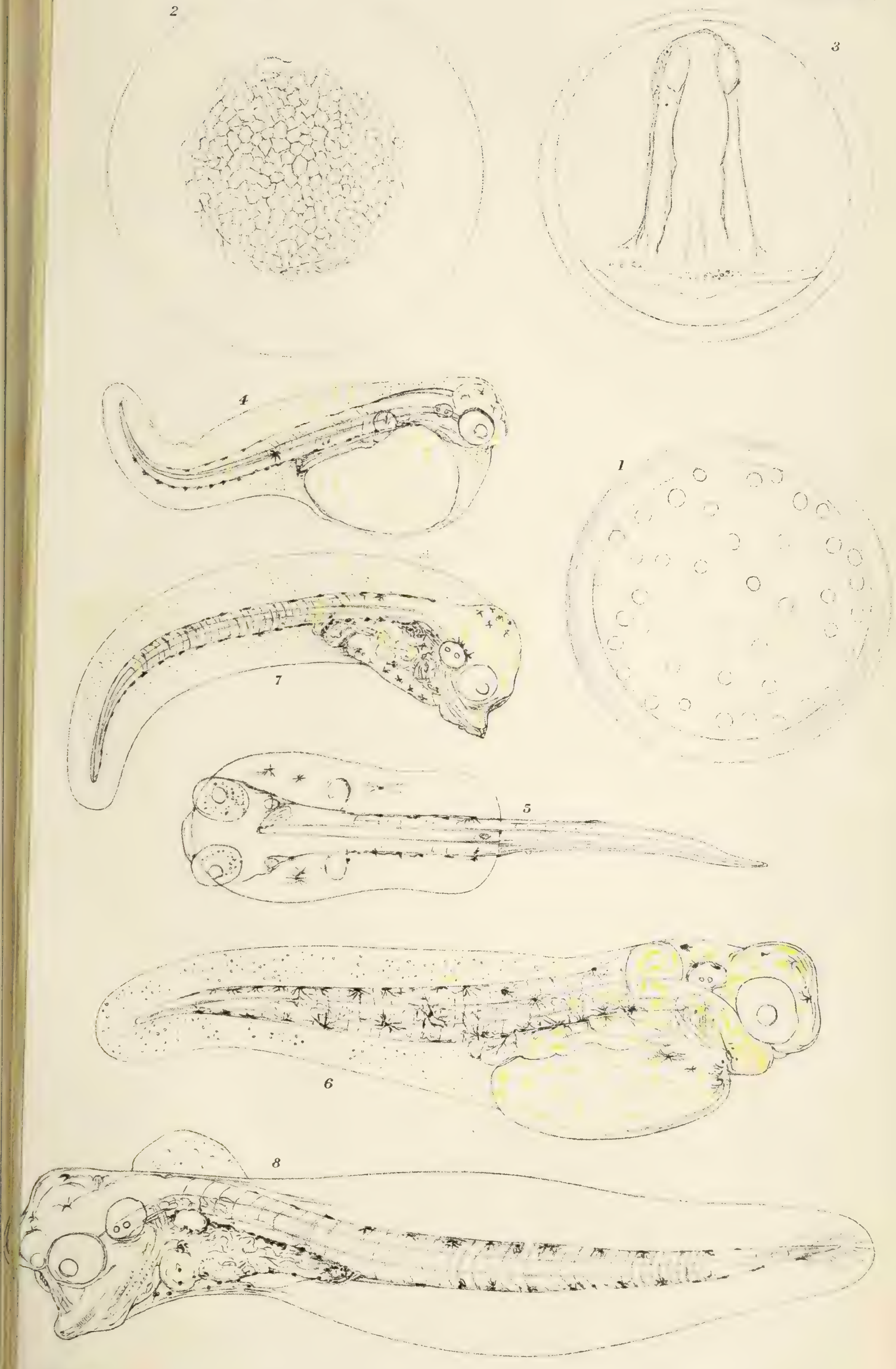
Fig. 5. Head of a specimen about a day older, floating near the surface of the water, with the head depressed. Ventral aspect. × about 35.

Fig. 6. Lateral aspect of the larval poor cod on the 16th June. The stellate condition of the black chromatophores is marked, and the pectorals are large. × 44.

Fig. 7. Somewhat older larval poor cod of the 18th June, in a nearly moribund condition. The disappearance of the yolk, the increase of black pigment on the abdomen, and the presence of the swim-bladder (*sb.*) are the most noteworthy features. × 26.

Fig. 8. Larval poor cod of the same date, but somewhat older (from a previous series). × 57.

PLATE VIII.



W. C. M. del

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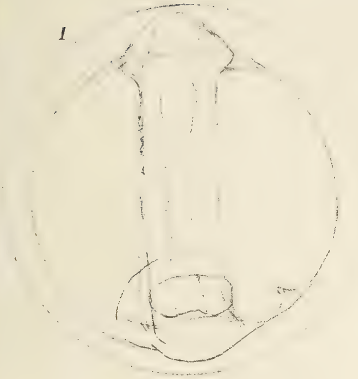

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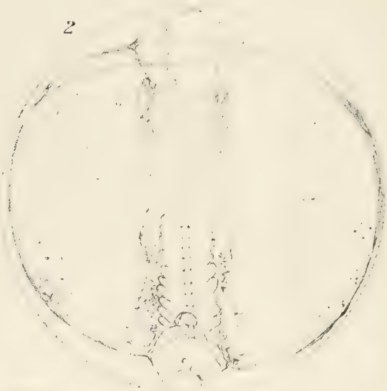

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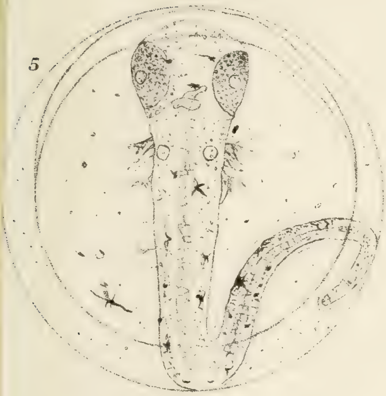

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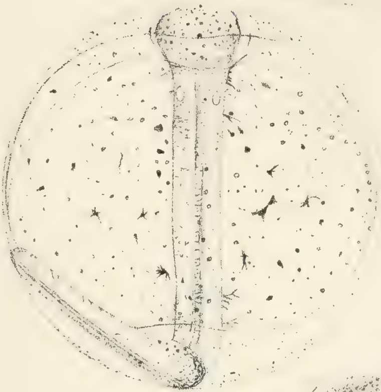

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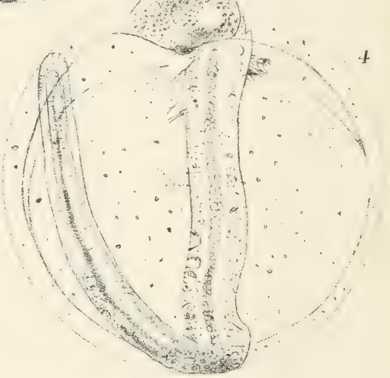

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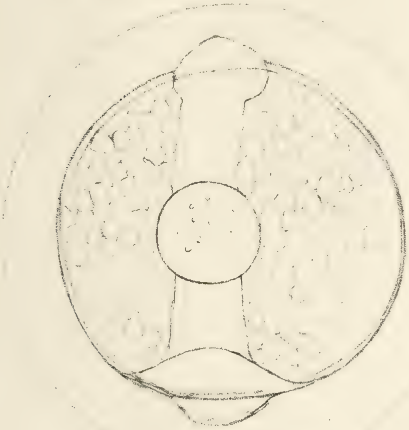

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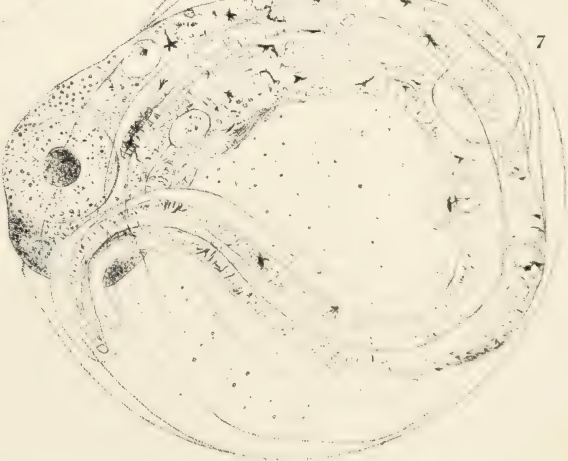

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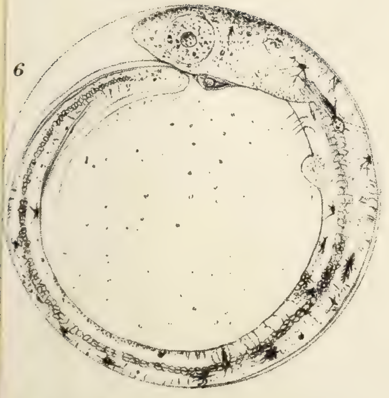
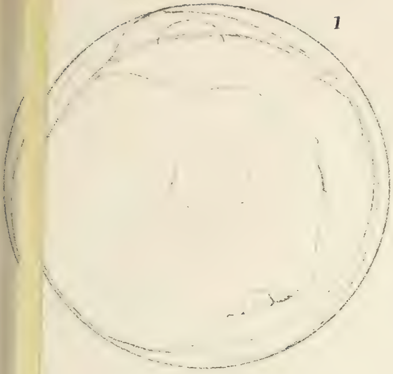


W. C. M., figs. 1, 2, and 8.
Cætera *J. M. Anderson, M.A.*

PLATE X.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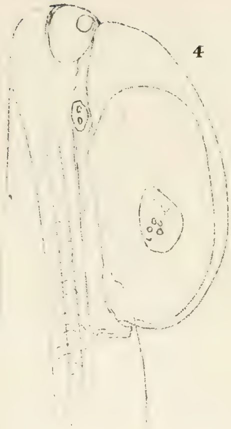
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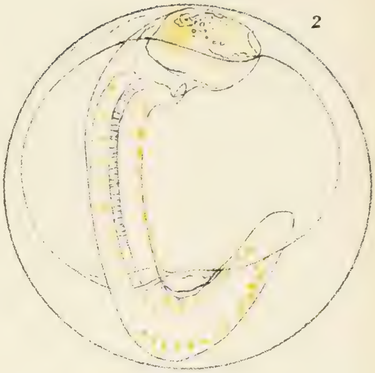
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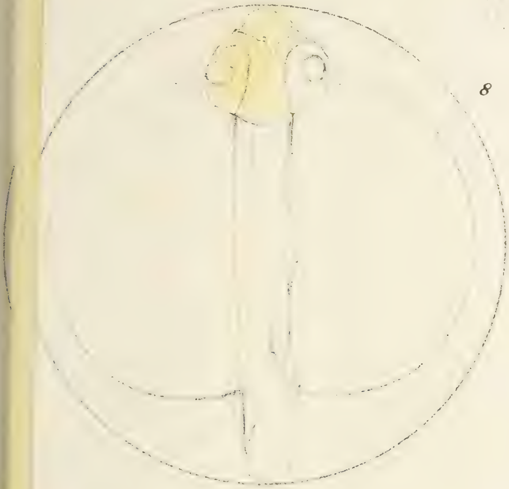
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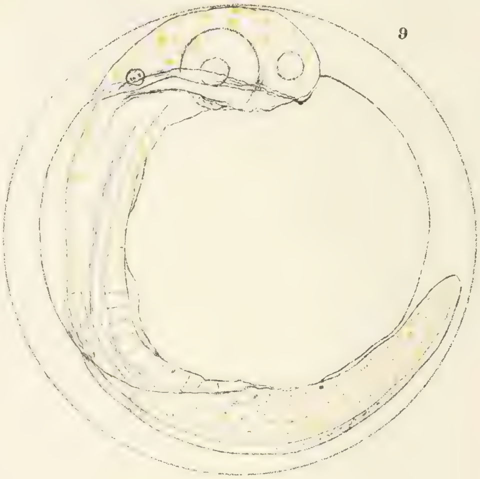
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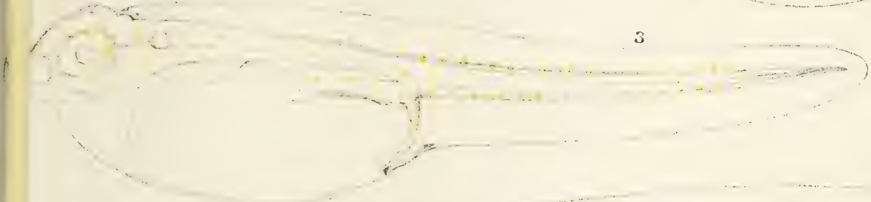
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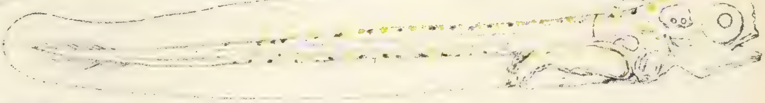
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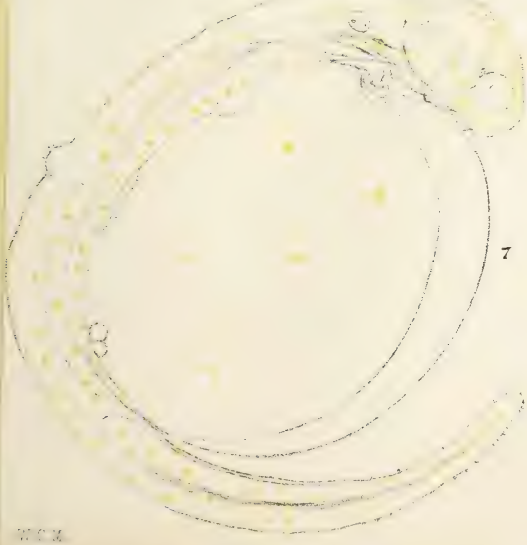
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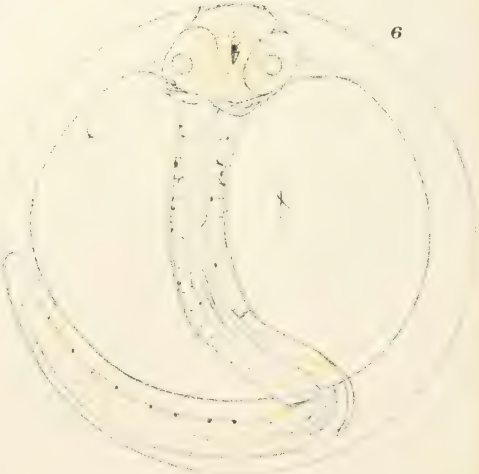
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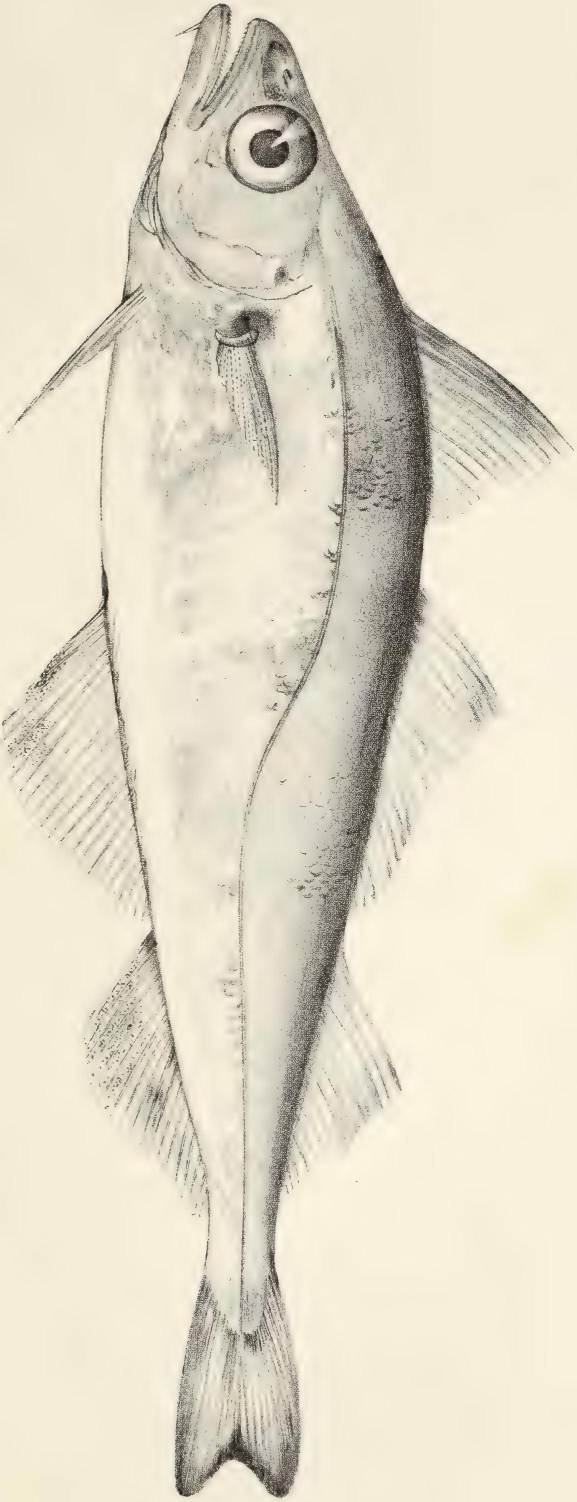
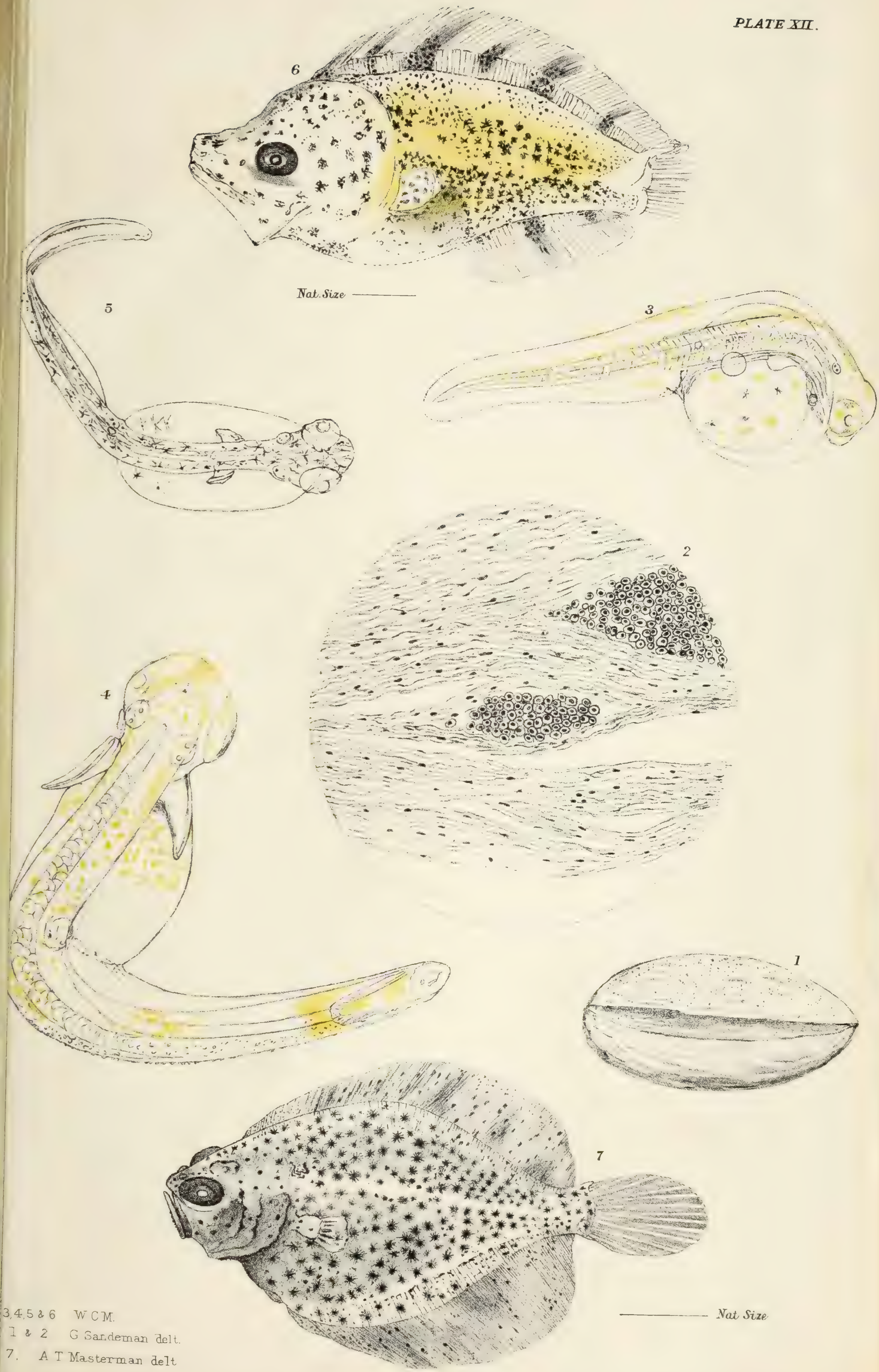


A T Masterman del

Peculiar Poor Cod
(Gadus minutus)



3,4,5 & 6 W C M.
1 & 2 G Sandeman delt.
7. A T Masterman delt

PLATE IX.

Fig. 1. Egg of the coal-fish or green cod (*Gadus virens*) fertilised on 31st March at 4 P.M. in Shetland, and figured at 9 P.M. on April 3rd, 1893. The blastopore is closing. × 33.

Fig. 2. Egg of the same species next day. The blastopore has closed, and Küpffer's vesicle is present. The muscle-plates are also forming. × 33.

Fig. 3. Egg of the green cod on the 6th April, showing radiate fibres from the pectoral region, and the presence of black pigment over the yolk, and also indications of similar chromatophores along the body. Similarly magnified.

Fig. 4. Egg of the same species, of date 7th April, with a general distribution of pigment, and indications of chromatophores along the body. Similarly magnified.

Fig. 5. Another specimen, of date 7th April, in which the pigment over the yolk is somewhat less marked, but the black chromatophores along the body and tail are distinct. Similarly magnified.

Fig. 6. Egg of date 8th April, with advanced embryo, which has a series of conspicuous black chromatophores along the sides. The tip of the tail now reaches the head. Similarly magnified.

Fig. 7. Embryo of the green cod, partially hatched, and with the pigment over the body and yolk-sac largely developed. × about 33.

Fig. 8. Unknown egg, resembling that of the mackerel, from Aberdeen, 11th June 1892. × 44.

PLATE X.

Fig. 1. Early condition of the small egg resembling that of the dab, and measuring ·6858 to ·7620 mm., 10th June 1892. × about 57.

Fig. 2. The same egg on the 11th June, with the pigment developed. Similarly magnified.

Fig. 3. Free larva of the first day—from the foregoing. × 44.

Fig. 4. A larva of the same age (12th June), showing a peculiar movable oleaginous area in the yolk. × 44.

Fig. 5. Early post-larval fish (hatched on the 13th June) from the same kind of egg, 21st June 1892. × 21.

Fig. 6. Unknown egg measuring 1·3335 mm., with advanced embryo, 11th June 1892. × 44.

Fig. 7. Larval fish from the foregoing, in a somewhat unhealthy condition, 16th June 1892. × 44.

Fig. 8. Unknown egg, measuring 1·2192 mm., with a considerable perivitelline space, 12th June 1892. × 44.

Fig. 9. The same egg, with the large embryo in a lateral position, 13th June 1892. × 44.

PLATE XI.

Fig. 1. Sketch of the peculiar example (hybrid?) of the poor cod, by Mr Masterman. Life size.

PLATE XII.

Fig. 1. Tumour from the dorsal muscles of the tunny.

Fig. 2. Section of the foregoing. Zeiss, oc. 3, obj. D.

Fig. 3. Larval fish, of 16th June 1892, from the unknown egg with a considerable Perivitelline space.

Fig. 4. An older example of the same species viewed from the dorsal aspect, × 44.

Fig. 5. Unknown larva having only black pigment, 17th June 1892. × about 21.

Fig. 6. Turbot-like form enlarged under a lens.

Fig. 7. Young turbot of about 14 mm. enlarged about six times.

V.—GENERAL REPORT ON THE PELAGIC EGGS, LARVAL, AND YOUNG FISHES PROCURED BY THE 'GARLAND' IN 1892 AND 1893. By Arthur T. Masterman, B.A., late Scholar of Christ's College, Cambridge.

General Remarks.

A fairly abundant number of observations of the occurrence of pelagic ova on the East Coast area having been kept during the last 3 or 4 years, a comparison between the various stations is possible.

In the Sixth Annual Report the stations of the Forth are grouped together into two series, an inner and an outer, the former comprising the Stations I., II., III., and IV., with Cross-Section III., and the latter the Stations V., VI., and VII., with Cross-Section II. To these divisions we may add a third, comprising the district Island of May, the Stations VIII. and IX., and Cross-Section I. At the present stage of our knowledge, a detailed comparison between the stations within each of these groups can hardly be made with any degree of accuracy, but by forming the stations into groups, which differ in their physical conditions, we may expect to find at least perceptible differences between these groups in their characteristic larval and young fishes, and in their pelagic ova.

In Group I. the ova seem usually to be abundant, and the bottom abounds with all the common forms of larval, post-larval, and young fishes. The eggs first appear in February, those of the plaice and long rough dab being in great abundance, succeeded towards the end of this month by the haddock and cod.

During March the eggs of the haddock are abundant, and these are the predominant ova till the middle of April, at which period the majority appear to hatch. Cod are rather later, but fairly plentiful, as also are plaice. Rockling were found in abundance, in 1890, as early as March, but they appear usually to be the most abundant ova about the end of April. Towards the end of this month dab also become more common, and gurnard make their first appearance. The eggs of the sprat seem to occur just at the end of April, though, in 1893, abundance of them are reported throughout the last week, all in early stages. The whiting, bib, flounder, and poor-cod are found in small numbers at the same period. In May the post-larval and larval forms, with young fishes, are abundant. The sprat and gurnard become the dominant forms of egg, with great numbers of rockling; among rarer forms appear this month the lemon dab, the brill, and the dragonet. The predominance of sprat, gurnard, and rockling is continued steadily throughout June, and in this month also the ova of turbot and ling are met with, though in limited numbers. In July the number of ova undergoes a distinct diminution, the sprat, gurnard, and rockling being all at hatching stage, and still fairly plentiful; turbot, lemon dab, &c., are still found.

In August the ova are still less in number, and of the same kinds as in July, but the young fishes at the bottom become very plentiful, especially gobies, herrings, and sprats.

In October the young clupeoids swarm, together with pleuronectids, gobies, and dragonets. In December there are a few sparse records of young fishes of the same kinds as above.

In the Second Group of Forth Stations, V., VI., and VII., with Cross-Section II., and the Elie Ness district, amongst the bottom forms the post-larval Montagu's sucker and sand-eels seem to be very characteristic of this area, whilst other young fish are abundant, including armed bullhead and gunnel, pleuronectids and clupeoids, and a few gadoids. Amongst the ova, those of the rockling appear in abundance as early as March, and in 1893 the gurnard's eggs appear also in March.

The general features of the distribution of ova seem to resemble those of the first group of stations, but the long rough dab occurs later than in the latter. In May the whiting and poor-cod seem the most abundant ova, taking the place of the immense quantities of sprat in Group I. Müller's topknot appears as isolated specimens in May. Abundance of young sand-eels and clupeoids occur all over this area.

In June the gurnard and rockling ova predominate as in Group I., and the sprat become abundant. The ling occurs not unfrequently.

The sprat become the most numerous ova in July, gurnard and rockling still abounding. In August there are great quantities of post-larval pleuronectids, along with gobies and sand-eels. The lemon dab ova seem to be absent from this region, or, at any rate, the capture of none is recorded.

In Group III. (Stations VIII. and IX., and Cross-Section I.) there have been few data obtained, but, as far as can be judged, eggs are usually to be obtained in fair numbers in this district, and in general characters they seem to resemble mostly those of Group II.

In this group must be included Liston Bank and the area of more or less shallow water, extending from this to the Island of May.

In March and early April enormous quantities of haddock eggs are found here, with also plaice and long rough dab in abundance, and lesser quantities of cod and a few whiting. On the whole their development appears to be rather later than that of the eggs in the foregoing groups.

The eggs of the gurnard and the sprat are not abundant, the rockling however being very plentiful. These eggs, as above, also appear to be rather later in development than those of the groups farther up the Firth.

Young gadoids and sand-eels, ranging from 5 mm. to 14 mm., abound, but clupeoids are not so generally distributed nor so abundant.

Comparing the groups of stations together, it appears that, as a very general rule, we may say that the eggs of gadoids and pleuronectids are most abundant in the outer seaward stations; haddock, plaice, long rough dab and cod spawning in greatest profusion in the Island of May and Liston Bank areas, and the smaller gadoids, such as poor-cod and whiting, seeming to come nearer shore, their favourite spawning grounds (as far as can be told by the distribution of the eggs as found) being rather more inshore in region of Cross-Section II. and Stations V., VI., and VII. The rockling, on the other hand, is characterised by a very wide distribution, these eggs being found in great abundance in all the Stations of the Forth.

The eggs of the sprat, and, to a lesser extent, of the gurnard, seem to be most plentiful in the upper reaches of the firth, and are abundant in the Inchkeith district, but they become less common out to, and beyond the Island of May.

Hardly a sufficient number of the rarer eggs have been obtained to make any such statements as these concerning them.

The larval and post-larval fishes to a great extent bear out this distribution also, the gadoids and pleuronectids appearing rather to predominate in the outer stations, and also to be rather larger there. In the present state of our knowledge, it is hard to say what influence the tide and river currents may have upon the distribution of the eggs at different months of the year. As regards development, it appears to be a somewhat general rule that the ova in the upper reaches are at a slightly later stage than those lower down the estuary, which may be due either to the effect of tidal currents or to the higher mean temperature of the former.

In this connection it is noteworthy to observe that the egg of the rockling is not only the most generally distributed of all forms, but it also has the longest spawning season, ranging from March to August. Whether these features of longest range in time and space are really fundamentally connected, it would be hard at present to say with certainty.

Observations upon the eggs occurring in the districts of the Moray Firth and Smith Bank have been very meagre, from the fact that the 'Garland' is too small to go there frequently. One entry occurs in February 1890, when plaice eggs are mentioned as having been found in great numbers in the early part of this month.

No records have been obtained of eggs found in March or early April, but this year we have a few results in the end of April and beginning of May. Amongst these the cod, green cod, and allied gadoids appear to be most prominent, poor-cod and whiting being also common. Among pleuronectids the lemon dab is common, as also the dab and flounder, the turbot occurring fairly frequently. Rockling occur in their accustomed abundance, and a very few gurnard. A few eggs of the long rough dab and plaice also are found. For the greater part of May, and for June, July, and August, no observations whatever have been taken, whilst a solitary entry of some few rockling and one gurnard in September complete our knowledge of this area.

The three divisions of the Moray Firth area may be defined as—I., that of Stations I., II., and III., and all the Cromarty Firth region ; II., Stations IV., V., and VI., and all the area of Dornoch Firth ; III., Stations VII., VIII., and IX.

These three groups are well separated physically, but a far greater number of observations, extending over a greater time, will be necessary before any comparison can be made between them as regards distribution of pelagic ova. In fact, the Moray Firth at present cannot in any way be satisfactorily compared even with the Firth of Forth.

Comparing these two areas during late April and early May, we find that the lemon dab and the turbot both seem to occur in greater abundance in the former, whilst there are very few sprat and gurnard ; but it is not known whether these become plentiful rather later, as in the Forth. The occurrence of long rough dab and plaice, even at an early stage of development, up to the middle of May, is to be noted ; and this fact, together with a comparison of the average stage of development of the rockling with that of the same egg in the Forth, may allow us to conjecture that, on the whole, the eggs are rather later in development in the Moray Firth than in the latter, but with so few data nothing can be stated with certainty.

The six stations of Smith Bank were worked over for a few days in May this year by the 'Garland,' and numerous eggs were obtained. In this district the same peculiarity as at the inner stations is noticed as regards the very late survival of the eggs of fish whose spawning period is comparatively early. Thus, we find here the eggs of the long rough dab occurring on 10th and 11th May in fair numbers, with the embryo only half round the yolk. These are the latest observations recorded ; but, at least, we have the plaice and the long rough dab and also the ling occurring here to nearly the end of May, which is very remarkable.

A curious feature of this district is the great scarcity, in the collections at present obtained, of the eggs of the rockling. In the Stations in Groups I. and II. of the Moray Firth the rockling appears in its usual profusion ; but in Group III., *i.e.*, Stations VII., VIII., and IX., the eggs of this gadoid are only found in very small numbers ; and, lastly, at Smith Bank they appear to be almost entirely absent. This is the more remarkable when the wide distribution of this egg is taken into account.

Amongst other eggs we note that the gurnard is very abundant, and occurs at all stages, whilst the sprat is only found in very small numbers. Amongst pleuronectids the witch and lemon dab may be noted.

The bottom-nets gave a very few young fishes, which were principally gadoids and sand-eels. Clupeoids are here markedly absent, though a few occur at the inner stations in the Moray Firth.

Beyond these few observations nothing more can be added about this important area until more extended observations have been taken there. Of the remaining divisions of the East Coast, the Aberdeen and Montrose Districts have received up till now a passing attention, and only a few superficial notes are recorded concerning the ova found in these regions. Finally, in the region of St Andrew's Bay matters are in a very different condition, and its pelagic fauna has been so fully reported elsewhere that nothing can be added here.

EXPERIMENTS ON PRESERVATIVE SOLUTIONS.

Experiments, with a view to discovering a satisfactory and simple method of killing and preserving pelagic ova, were renewed at the Laboratory this year. A number of fresh and dead ova were hardened in various solutions, and preserved in other solutions for periods extending over several months, and the condition of the ova was carefully observed from time to time. Measurements were taken before and after the various stages of the experiments.

Amongst killing reagents used, the only one which gave at all satisfactory results was the solution which was found to be successful last year also—namely, a saturated solution of picric acid in 5 per cent. hydrochloric acid. The ova are exposed to its action for about three minutes, when they may be removed to the preserving fluid directly without any washing. Experiments seem to show that a great part of the contraction which always takes place is due to the process, formerly persevered in, of washing with water. A slight washing with the preservative fluid itself, may, however, be of advantage.

Corrosive sublimate, as a killing reagent, does not seem to have any advantage over the above in the way of contraction or condition of the embryo, and it has the great drawback of rendering the yolk and embryo densely opaque.

As regards preservative fluids, the one which seemed most satisfactory last year, namely, picric acid 1 part, methylated spirit 1 part, and 2 per cent. acetic acid 1 part, after the experience of continual usage, cannot be recommended. The shrinkage was about the same as in 60 per cent. spirit, namely, an average of about 10 per cent. diameter in eighty days, but in some cases the extent was uncertain, whilst the injurious effect of the picric acid upon instruments and upon the operator makes it an objectionable reagent. Its effect in darkening and rendering more distinct the oil-globule is undoubted, but this effect may be obtained to as great a degree as is necessary by the use of the same reagent in the killing fluid recommended above.

In a solution consisting of equal parts of alcohol and acetic acid (2 per cent.), the average shrinkage in forty-eight days was about 10 per cent., and this increased in eighty days to about 18 per cent. for the larger eggs like long rough dab, the smaller eggs not shrinking further. The eggs were well preserved, but the yolk tends to opacity, as in the 60 per cent. preparation. The oil-globule remains a transparent yellow (usually), and is fairly distinct. Towards the end of the eighty days, some of the eggs showed a tendency to blackening.

In a solution of 4 parts alcohol, 4 parts acetic acid (2 per cent.), and 1 part camphor, the shrinkage in forty-eight days was about 11 per cent. diameter, and this remained the same at the expiration of eighty days. The eggs were in good condition, the oil-globule being in most cases readily recognisable and the yolk transparent.

Most of the ova from the 'Garland' this year have been preserved in this solution, and they have been in most cases in good condition for diagnosis.

The only drawbacks to this mode of preparation are the rather high shrinkage, and a tendency for the camphor to crystallise out upon the surface of the egg. The crystals can be removed by treatment with a little of a solution of equal parts alcohol and acetic acid, and the defect could probably be prevented by making up the solution with a slightly smaller proportion of camphor. Some good results were obtained by the use of a simple solution of 2 per cent. acetic. In the case of seven ova of various kinds which were killed in picrohydrochloric solution and transferred to this solution, by the end of forty-eight days they were in particularly good condition, the embryo and yolk being both clear and translucent, the black pigment clearly distinguishable, and the oil-globule very distinct. The shrinkage in some was not appreciable, four of the eggs measuring exactly the same as in the living condition, the other three shrinking 2 per cent., 4 per cent., and 5 per cent. respectively, the smaller eggs appearing to undergo the greater contraction. Very little alteration of any sort was observed in the eggs at the expiration of eighty days.

Further experiments may bring to light various objections to the use of this reagent as a preservative fluid, such, for example, as its action after a time on the zona, but at present it gives promise of a simple and efficacious method of preserving pelagic ova.

In the Special Report of this year's work by the 'Garland' given below it will be seen that a fair number of entries occur in each of the 6 regions above mentioned, and a great deal of fresh knowledge and material has thereby been acquired.

The larval and post-larval fishes below have been identified and arranged by Professor M'Intosh, to whom the writer is also greatly indebted for invaluable assistance throughout the whole of this report.

I. MONTROSE BAY.

Station I.—Surface, 19th May 1893. Gadoid, 20 mm.

Station I.—Surface, 19th May 1893. 27 eggs of gurnard, various stages, embryo $\frac{1}{3}$ round to advanced; 1 egg of topknot, early; 4 eggs of rockling, embryo $\frac{1}{2}$ round to $\frac{3}{5}$; 1 egg of turbot, embryo $\frac{3}{5}$ round; 27 eggs of dab, various stages; 4 eggs of poor-cod, embryo $\frac{1}{2}$ round.

Station I.—Bottom, 19th May 1893. Clupeoid, 20 mm.; 2 gadoids, 4 and 4·5 mm.; 2 pleuronectids, 5 and 8 mm.

Station I.—Bottom, 19th May 1893. 7 eggs of gurnard, $\frac{3}{5}$ to wholly round the yolk; 1 egg of whiting, early; 5 eggs of dab, various stages.

Station II.—Surface, 19th May 1893. 3 eggs of gurnard, embryo $\frac{1}{2}$ round; 1 egg of whiting, embryo $\frac{1}{2}$ round; 5 eggs of dab, mostly early.

Station II.—Surface, 19th May 1893. 4 gadoids, 9–11 mm.; *Cottus*, 18·5 mm.; 3 gadoids, 7, 8, and 22·5 mm.; gunnel, 24 mm.; 9 pleuronectids, 5–11 mm.

Station II.—Bottom, 19th May 1893. 7 eggs of gurnard, embryo $\frac{1}{2}$ round and later; 6 eggs of topknot, early; 3 eggs of poor-cod, embryo $\frac{1}{2}$ round; 3 eggs of dab, embryo $\frac{1}{2}$ round; 2 eggs of bib.

II. MORAY FIRTH.

Station IV.—Surface, 2nd September 1892. 19 eggs of rockling, embryo about $\frac{2}{3}$ round yolk; 1 egg of gurnard, embryo over $\frac{1}{2}$ round; 1 unknown egg (13·5, Ross), yolk marked off from envelope.

Station V.—Surface, 2nd September 1892. Clupeoid, 16 mm.; pleuronectid, 11 mm.

Station V.—Bottom, 2nd September 1892. 2 Clupeoids (herrings), 7·5 and 13 mm.; pleuronectid, 6·5 mm.; dragonet, 6·5 mm.; rockling, 4·6 mm.

Station VI.—Bottom, 2nd September 1892. Clupeoid (herring). 11·5 mm.; pleuronectid, 8·5 mm.; 2 post-larval gurnards, injured, 32–42 mm.

Station I.—Surface, 29th April 1893. 127 eggs of dab, embryo about $\frac{2}{3}$ round; 6 eggs of long rough dab, one early, rest ready for hatching; 150 eggs of cod and green cod, embryo $\frac{1}{2}$ to $\frac{3}{5}$ round; 55 eggs of (?) poor-cod; 43 eggs of (?) lemon dab, embryo over $\frac{1}{2}$ round; 150 eggs of rockling, $\frac{1}{2}$ round; 1 egg of brill, embryo $\frac{3}{4}$ round; 4 eggs of haddock, early to $\frac{1}{4}$ round; 11 eggs of gurnard, embryo scarcely half round; 4 eggs of turbot, embryo $\frac{1}{2}$ round.

Station I.—Surface, 29th April 1893. Gadoids (?), 4–5 mm.

Station V.—Surface, 2nd May 1893. 3 eggs of haddock, early; 14 eggs of turbot, embryo $\frac{1}{3}$ to $\frac{1}{2}$ round; 37 eggs of flounder, early; 81 eggs of green cod at early stages to embryo $\frac{2}{3}$ round yolk; 70 eggs of dab, early; 130 eggs of cod and allies, mostly early; 104 eggs of (?) lemon dab, early; 135 eggs of rockling, early to $\frac{1}{2}$ round; 106 (?) poor-cod and whiting, more than $\frac{1}{2}$ round.

Station IV.—Surface, 2nd May 1893. About 100 eggs of rockling, embryo about $\frac{1}{2}$; about 130 eggs of cod, about to hatch; 2 eggs of sprat, early; 2 eggs of whiting, early; 25 eggs of (?) flounder; 2 eggs of plaice, ready to hatch; 3 eggs of long rough dab, ready to hatch; 36 eggs of pleuronectid, (?) lemon dab or witch, advanced; 30 eggs of (?) whiting; 2 eggs of gurnard, early; 83 eggs of dab, early to embryo $\frac{1}{2}$ round; 2 eggs of (?) green cod.

Station IV.—Bottom, 2nd May 1893. Gunnel; 10 young sand-eels, 8 to 20 mm.; numerous young gadoids, 4·5 to 8 mm; numerous pleuronectids (mostly long rough dabs), 5 to 10 mm.

Station V.—Bottom, 2nd May 1893. 7 sand-eels, 13–17 mm.; numerous gadoids, 4 to 5·5 mm.; numerous pleuronectids, 4·3 to 10 mm.

Station II.—Bottom, 3rd May 1893. Gunnel, 27 mm.; gadoid in medusa; numerous gadoids (chiefly cod), 4·5 mm.; pleuronectid (long rough dab), 6·5 to 11·5 mm. (eyes in most lateral); Montague's sucker, 3·5 mm.

Station III.—Bottom, 3rd May 1893. Numerous gadoids, 4·5 to 9 mm.; pleuronectids, 5 to 6 mm.; young sand-eel, 7 mm.

Station III.—Surface, 5th May 1893. 25 eggs of poor-cod and whiting, $\frac{1}{2}$ to advanced; 8 eggs of plaice, mostly advanced; 8 eggs of (?) haddock, various stages; 55 eggs of (?) flounder, embryo $\frac{1}{2}$ round to advanced; 1 egg of ling, nearly $\frac{1}{2}$ round; 68 eggs of gurnard, embryo $\frac{1}{2}$ round; 1 egg of dab, embryo $\frac{1}{2}$ round; 2 eggs of (?) poor-cod, over $\frac{1}{2}$ round; 3 eggs of (?) cod; 52 eggs of (?) bib, embryo $\frac{1}{2}$ to $\frac{3}{4}$ round; 14 eggs of lemon dab, embryo about $\frac{1}{2}$.

Station VII.—Surface, 8th May 1893. 2 eggs of plaice, advanced; 30 eggs of gurnard, embryo mostly about $\frac{1}{2}$ round; 2 eggs of rockling, embryo $\frac{3}{5}$ round; 9 eggs of (?) green cod, embryo about $\frac{1}{2}$; 7 eggs of poor-cod, early to embryo $\frac{1}{2}$ round; 8 eggs of (?) haddock, embryo $\frac{1}{2}$ to advanced; 1 egg of brill; 79 eggs of (?) lemon dab, embryo $\frac{1}{2}$ round; 14 eggs of (?) bib and witch, early to embryo $\frac{1}{2}$ round; 62 eggs of cod and allies, various stages; 2 eggs of turbot, embryo $\frac{1}{2}$ round.

Station VII.—Bottom, 8th May 1893. Young cod, 6 mm.; plaice; Montague's suckers; 3·5 to 4·5 mm.

Station VIII.—Surface, 8th May 1893 Plaice, embryo nearly $\frac{1}{2}$ round; 121 eggs of gurnard, various stages; 4 eggs of rockling; 16 eggs of (?) flounder, embryo about $\frac{1}{2}$; 18 eggs of (?) sprat, various stages; 26 eggs of (?) bib; 4 eggs of dab; 19 eggs of (?) lemon dab; 11 eggs of whiting.

Station IX.—Surface, 8th May 1893. 68 eggs of gurnard; 4 eggs of (?) bib, advanced; 37 eggs of pleuronectid, (?) lemon dab, embryo $\frac{3}{5}$ to $\frac{4}{5}$ round; 1 egg of turbot, embryo $\frac{4}{5}$ round; 1 egg of rockling, embryo over $\frac{1}{2}$ round; 1 egg of dab, embryo $\frac{3}{5}$ round; 5 eggs of (?) flounder, mostly advanced; 4 eggs of sprat; 18 eggs of pleuronectid, lemon dab (?), mostly well advanced; 5 eggs of plaice (?), injured; 29 eggs of whiting.

IIa. SMITH BANK.

Station ?—Surface, 4th May 1893. 4 eggs of plaice, embryo $\frac{3}{5}$ round; 28 eggs of gurnard, embryo $\frac{3}{5}$ round; 2 eggs of whiting, early; 2 eggs of dab; 4 eggs of flounder, embryo about $\frac{1}{2}$ round; 4 eggs of haddock; 18 eggs of pleuronectid (?), embryo $\frac{3}{5}$ to advanced; 2 eggs of sprat, advanced; 3 eggs of dragonet, embryo about $\frac{3}{5}$; 4 eggs (?) poor-cod, embryo $\frac{1}{2}$ to $\frac{3}{5}$; 1 egg of ling, early; 14 eggs of green cod, embryo $\frac{1}{2}$ to more advanced.

Station ?—Surface, 4th May 1893. Sand-eels, 15 to 19 mm.

Station I.—Surface, 10th May 1893. 3 eggs of long rough dab, mostly advanced, some just free from yolk; 4 eggs of plaice (injured); 182 eggs of gurnard; 25 eggs (?) haddock; 53 eggs (?) lemon dab; 47 eggs of gadoids (?), various stages; 14 eggs (?) whiting, early to embryo $\frac{1}{2}$ round; 1 egg of ling, early; 2 eggs of dab, early; 18 eggs (?) flounder, early to embryo, $\frac{1}{2}$ round.

Station II.—Surface, 10th May 1893. 94 eggs of gurnard, embryo $\frac{1}{2}$ to $\frac{3}{5}$ round; 24 eggs of long rough dab, well advanced; 5 eggs of plaice, embryo about $\frac{1}{2}$ round; 2 eggs of rockling, early; 2 eggs of turbot; 2 eggs of haddock, early; 31 eggs (?) lemon dab, embryo about $\frac{1}{2}$ round; 9 eggs of dab, early to embryo, $\frac{1}{2}$ round; 25 eggs (?) flounder, various stages; 17 eggs chiefly (?) sprat, various stages; 30 eggs (?) bib (·9144 to ·9906 mm.); about 100 eggs of witch and gadoids (?), various stages.

Station II.—Bottom, 10th May 1893. Young *Cotti*, 7–7·5 mm.

Station III.—Surface, 10th May 1893. 6 eggs of plaice, embryo about $\frac{1}{2}$ round; about 250 eggs of gurnard, various stages; 62 eggs of dab, early to embryo $\frac{1}{2}$ round; 2 eggs of rockling, embryo $\frac{1}{2}$ round; 14 eggs of sprat; 14 eggs of turbot; 6 eggs of ling; 49 eggs chiefly of poor-cod and whiting; 19 eggs of lemon dab (?); 10 eggs of witch and gadoids (?).

Station V.—Surface, 10th May 1893. 11 eggs of plaice, early to embryo, about $\frac{1}{2}$ round; 31 eggs of long rough dab, various stages; 31 eggs of dab, various; 92 eggs chiefly of poor-cod, whiting, and sprat; 41 eggs of lemon dab (?), embryo about $\frac{1}{2}$; 1 egg of ling; 3 eggs of turbot.

Station V.—Bottom, 10th May 1893. Gadoids, 7 mm.; motella, 4 mm.

Station IV.—Surface, 11th May 1893. 21 eggs of plaice, early to embryo, about $\frac{1}{2}$ round; about 300 eggs of gurnard, various stages; 1

egg of turbot; about 100 eggs of lemon dab (?); 93 eggs of poor-cod, whiting, and sprat; 2 eggs of dab, early.

Station IV.—Bottom, 11th May 1893. Gadoid, 7 mm.

Station VI.—Surface, 11th May 1893. 8 eggs of long rough dab, embryo ½ round; 48 eggs of gurnard, early to embryo ½ round; 9 eggs of lemon dab, embryo mostly ½ round; 29 eggs of cod and allies, early to embryo ½ round; 1 egg of dab, advanced; 3 eggs of sprat, early to ½; 1 egg of poor-cod, embryo ½ round.

Station VI.—Bottom, 11th May 1893. Plaice, 8·5 to 11 mm.; post-larval fish, with pigment on head, dorsally and over abdomen (hake ?).

III. FIRTH OF FORTH AND OFF THE ISLAND OF MAY.

Station VII.—Surface, 2nd May 1892. 18 eggs of cod; 56 eggs of haddock; 15 eggs of rockling; 2 eggs of gurnard.

Station VII.—Bottom, 2nd May 1892. 1 egg of turbot; 7 eggs of dab; 26 eggs of rockling; 21 eggs of poor cod and whiting; 3 eggs of plaice; 25 eggs of (?) bib; 16 eggs of (?) lemon dab; 1 egg of long rough dab.

Station VII.—Bottom, 2nd May 1892. 2 sand-eels, 10·5 mm.; 2 Montague's suckers, 4·5 and 7·5 mm.

Station V.—Surface, 2nd May 1892. 70 eggs of haddock; 6 eggs of cod; 25 eggs of whiting and poor cod; 97 eggs of rockling; 7 eggs of plaice.

Station IX.—Surface, 6th May 1892. 1 egg of long rough dab, nearly at hatching stage; 3 eggs of plaice; 10 eggs of gurnard, embryo ⅔ round the yolk-sac; 17 eggs of rockling; 30 eggs of cod; 69 eggs of bib; 29 eggs of haddock.

Station IX.—Bottom, 6th May 1892. 2 eggs of plaice; 9 eggs of cod; 1 egg of haddock; 10 eggs of green cod; 12 eggs of bib; 6 eggs of rockling; 7 eggs of gurnard, embryo ⅔ round yolk.

Station VIII.—Surface, 9th May 1892. 15 eggs of long rough dab; 41 eggs of gurnard; 57 eggs of rockling; 3 eggs of whiting; 108 eggs of cod and allies; 43 eggs (?) green cod; 36 eggs of poor-cod and whiting.

Station VIII.—Bottom, 9th May 1892. 13 eggs of gurnard; 2 eggs of ling; 28 eggs of rockling, embryo ⅔ round yolk; 46 eggs of cod and allies; 5 eggs of haddock; 26 eggs (?) green cod; 27 eggs of poor-cod and whiting.

Station IX.—Surface, 25th May 1892. 17 eggs of rockling, embryo ⅔ round yolk; 77 eggs of gurnard; 24 eggs of haddock; 20 eggs of dab; embryo completely round yolk.

Liston Bank.—Surface, 26th May 1892. 94 eggs of whiting; 21 eggs of dab; 14 eggs of haddock; 29 eggs of gurnard; 38 eggs of rockling.

Liston Bank and Island of May.—Surface, 26th May 1892. 1 egg of topknot; 117 eggs of gurnard and allies; 8 eggs of rockling.

West of Liston Bank.—Surface, 26th May 1892. 32 eggs of rockling; 6 eggs of dab; 129 eggs of gurnard and allies; 35 eggs of haddock; 90 eggs of whiting.

Cross-Section II., South Half.—Surface, 27th May 1892. 52 eggs of rockling; abundance of eggs of sprat and whiting; 9 eggs of gurnard; 29 eggs of dab; 3 eggs of bib.

Cross-Section II., North Half.—Surface, 27th May 1892. 71 eggs of gurnard; 31 eggs of rockling; 171 eggs of sprat; 50 eggs of brill and allies.

Cross-Section I., Mid-Way.—30th May 1892. 14 eggs of rockling; 8 eggs of haddock; 10 eggs of poor-cod.

Cross-Section I., North End.—Surface, 30 May 1892. 28 eggs of gurnard; 26 eggs of whiting; 14 eggs of dab and sprat.

Cross-Section III., South End.—Surface, 31st May 1892. 14 eggs of rockling; 41 eggs of whiting; 19 eggs of gurnard; 22 eggs of sprat and dab.

Cross-Section III., North End.—Surface, 31st May 1892. 202 eggs of gurnard and allies; 238 eggs of rockling; 75 eggs of sprat.

West of Eyebrough.—Mid-water and bottom, 2nd June 1892. 2 eggs of gurnard; 4 eggs of rockling; 11 eggs of poor-cod and sprat; 2 eggs of lemon-dab.

East of Inchkeith.—Surface, 4th June 1892. 2 eggs of gurnard; 3 eggs of rockling; 12 eggs (?) cod; 10 eggs of sprat; 72 eggs of poor-cod and whiting.

East of Inchkeith, Second Haul.—Surface, 4th June 1892. 18 eggs of gurnard; 185 eggs of poor-cod, sprat and whiting; 13 eggs of rockling.

East of Inchkeith, Third Haul.—Surface, 4th June 1892. 47 eggs of gurnard, embryo $\frac{1}{2}$ to $\frac{2}{3}$ round yolk; 5 eggs (?) cod; 132 eggs of poor-cod, whiting and sprat; 5 eggs of topknot; 13 eggs of rockling, embryo $\frac{2}{3}$ to $\frac{4}{5}$ round yolk.

East of Inchkeith, First Haul.—7 fathoms, 4th June 1892. 24 eggs (?) cod; 164 eggs of poor-cod and whiting; 23 eggs of sprat; 3 eggs of haddock; 1 egg of plaice; 4 eggs of dab; 1 egg of rockling; 18 eggs of gurnard.

East of Inchkeith.—8 fathoms, 4th June 1892. 40 eggs of gurnard; 38 eggs of sprat; 2 eggs (?) cod; 75 eggs of poor-cod and whiting.

East of Inchkeith.—10 fathoms, 4th June 1892. 21 eggs of gurnard; 2 eggs of rockling; 2 eggs (?) cod; 3 eggs of sprat; 62 eggs of poor-cod and whiting.

East of Inchkeith.—Bottom, 4th June 1892. 54 eggs of poor-cod and whiting; 11 eggs of sprat; 4 eggs (?) cod; 3 eggs of gurnard; 2 eggs of rockling; 1 egg of plaice; 1 egg of dab.

East of Inchkeith, First Haul.—Bottom (deep-water), 4th June 1892. 15 eggs of gurnard; 70 eggs of poor-cod, &c.; 10 eggs of cod; 8 eggs of sprat; 1 egg of turbot.

East of Inchkeith, Second Haul.—Bottom, 4th June 1892. 39 eggs of gurnard; 1 egg of flounder; 19 eggs of sprat; 76 eggs of poor-cod and whiting; 3 eggs of rockling.

East of Inchkeith, Third Haul.—Surface, 4th June 1892. Fragmentary *Cottus*, probably about 7 mm.

East of Inchkeith, Third Haul.—Bottom, 4th June 1892. 4 eggs of gurnard; 1 egg of ling; 15 eggs of cod.

Station VIII.—Surface, 9th June 1892. 21 eggs of gurnard; 10 eggs (?) cod; 2 eggs of dab.

Station IX.—Surface, 10th June 1892. 45 eggs of gurnard; 8 eggs of sprat; 13 eggs of rockling, embryo $\frac{2}{3}$ round yolk-sac.

Station I.—Surface, 10th June 1892. 7 eggs (?) cod, embryo $\frac{1}{2}$ to completely round yolk; 3 eggs of bib, embryo nearly round.

Station V.—Surface, 13th June 1892. 3 eggs of gurnard, embryo $\frac{4}{5}$ round yolk; 1 egg of ling; 5 eggs (?) cod, embryo $\frac{4}{5}$ round yolk; 3 eggs of rockling, embryo $\frac{4}{5}$ round yolk; 1 egg (?) haddock.

Station V.—Mid-water, 13th June 1892. 5 eggs of gurnard, embryo completely round yolk.

Station II.—Surface, 13th June 1892. 13 eggs of gurnard, embryo $\frac{4}{5}$ round yolk; 2 eggs of ling; 6 eggs (?) cod; 26 eggs of poor-cod and whiting.

Station IV.—Mid-water and bottom, 14th June 1892. 2 gadoids, 8 mm.; rockling, 4·5 mm.; all injured.

Station VI.—Surface, 15th June 1892. 8 eggs of gurnard, embryo ½ to ⅔ round the yolk; 13 eggs of rockling, embryo ½ round the yolk.

Station VIII.—Surface, 21st July 1892. 16 eggs of gurnard; 8 eggs of rockling; 6 eggs (?) green cod; 2 eggs of bib; 4 eggs of whiting; 6 eggs (?) haddock.

Station IX.—Surface, 21st July 1892. 8 eggs of gurnard; 3 eggs of dab; 6 eggs of rockling; 2 eggs (?) haddock; 2 eggs (?) green cod.

Station V.—Surface, 22nd July 1892. 11 eggs of gurnard; 1 egg of rockling; 5 eggs of poor-cod; 1 egg of whiting; 2 eggs (?) witch; 2 gurnard (dried) about 30 mm. and 33 mm.

Station VIII.—Bottom, 21st July 1892. Pleuronectid, 9 mm; 4 gobies, 3·5 to 4 mm.

Station I.—Surface, 23rd July 1892. 2 eggs of dab; 10 eggs of rockling.

Station VII.—Surface, 22nd July 1892. 3 eggs of gurnard; 27 eggs of rockling; 2 eggs of dab; 1 egg of poor-cod.

Station VII.—Bottom, 22nd July 1892. Gobies, 2·7 to 4·5 mm.

Station III.—Bottom, 25th July 1892. Dragonet, 4·7 mm.; numerous gobies, 3·2 to 6 mm.

Station VIII.—Surface, 13th September 1892. 3 post-larval gurnards, 8 to 10 mm.; 4 clupeoids, 8 to 12 mm.; rockling, 4·8 mm.; 2 dragonets, 4·8 and 5·8 mm.

Station IX.—Bottom, 13th September 1892. Pleuronectid, 8·5 mm., eyes lateral; gurnard, 11 mm.; 10 gobies, 10 to 27 mm.

Station VII.—Bottom, 14th September 1892. Gurnard, 10 mm.; 4 clupeoids, 15 to 16 mm.; 1 sand-eel, 20 mm.; 4 pleuronectids (lemon-dab, &c.), 7 to 10 mm.; 6 gobies, 4·5 to 11 mm.; dragonet, 4·5 mm.

Station IX.—Surface, 22nd December 1892. 4 large eggs, unknown, possibly distended eggs of plaice.

Station IX.—Surface, 17th January 1893. 18 large unknown eggs.

Six Miles East of Island of May.—Surface, 21st February 1893. 10 eggs of long rough dab; 2 eggs of cod; 1 egg of plaice; 2 eggs, probably dilated plaice.

'Carr.'— February 1893. 9 eggs of long rough dab; 3 eggs of cod; 29 eggs of plaice; 7 eggs, probably plaice.

(No Labels.)—20 jars along with above, all February 1893. Ova injured and dilated. An aggregate of about 4,400 eggs of long rough dab; 230 eggs of cod; 470 eggs of haddock; 5,400 eggs of plaice; and 1,400 eggs of doubtful form, probably dilated plaice. Most of these ova are in various stages of development up to that in which the embryo extends half-way round the yolk.

East of Island of May.—Surface, 3rd April 1893. 40 eggs of cod, early to almost completely round yolk; 15 eggs of rockling, early to ⅔ round; 215 eggs of haddock, early to ready to hatch; 39 eggs of dab, early to completely round; 70 eggs of long rough dab, early to ready to hatch.

Ten Miles east-south-east of Island of May.—6 fathoms, 4th April 1893. 17 eggs of plaice, embryo about ½ round; 113 eggs of dab and flounder, embryo ½ round yolk; 19 eggs of rockling, early to ½ round; 24 eggs of long rough dab, early to ready to hatch; 90 eggs of cod and whiting, early to ⅔ round; about 700 eggs of haddock, all stages.

Nine Miles east-south-east of Island of May.—Surface, 4th April 1893. 5 eggs of plaice, embryo ½ round; 440 eggs of haddock, mostly advanced; 19 eggs of rockling, early to ⅘ round yolk; 85 eggs of cod and allies, early to advanced; 176 eggs of dab and allies, early to well advanced; 33 eggs of long rough dab, early to hatching.

Station IX.—Surface, 14th April 1893. 3 eggs of dab, embryo well round yolk; 4 eggs of long-rough dab, early to advanced; 6 eggs, probably haddock, well advanced; 8 eggs of green cod, embryo ½ round; 16 eggs (?) lemon dab, over ½ round; 4 eggs of sprat, over ⅔ round yolk.

Station VII.—Surface, 17th April 1893. 10 eggs of rockling, embryo ½ round yolk; 14 eggs of dab and flounder, embryo ½ round; 5 eggs of sprat, embryo ½ round; 2 eggs of poor-cod, embryo ⅔ round; 6 eggs of cod, embryo well advanced; 6 eggs of bib, well advanced; 1 egg, doubtful haddock, ½ round; 1 egg of long rough dab.

Station IV.—Surface, 17th April 1893. 7 eggs of rockling; 1 egg of flounder; 1 egg of haddock; 1 egg of long rough dab.

Station IV.—Surface, 17th April 1893. Larval cod; 2 larval sprats; 2 post-larval *Cotti*, 6 mm.

Station VII.—Bottom, 17th April 1893. 2 post-larval *Cottus*, 5 mm.; post-larval agonus, 7 mm.; 4 post-larval sand-eels, 8–1·4 mm.; 2 post-larval clupeoids, 11 mm.

Station VI.—Bottom, 18th April 1893. Eggs of cod and haddock in abundance, cod hatching, haddock at an advanced stage; eggs of dab and rockling, well advanced and fairly abundant; eggs of whiting, a few, embryo about ⅔ round yolk; a few eggs of flounder, early stages; 4 eggs of plaice, nearly ready to hatch; several eggs of gurnard, nearly ready to hatch; a few eggs of long rough dab, embryo ½ round yolk.

Station VI.—Surface, 18th April 1893. Eggs, closely resembling those in Bottom-net.

Station II.—Surface, 19th April 1893. Abundance of eggs of sprat, early stage; with eggs of whiting and poor-cod; eggs of cod in abundance, and haddock, ready to hatch; abundance of eggs of rockling; a few eggs of long-rough dab and plaice.

Station III.—Surface, 19th April 1893. Eggs of sprat in abundance, very early stage; with eggs of whiting and poor-cod; a few eggs of flounder, embryo ½ round; a few eggs of rockling; eggs of long-rough dab; eggs of cod; eggs of haddock and plaice, mostly far advanced.

Station I.—Surface, 20th April 1893. 33 eggs of rockling, embryo little over ½ round yolk; 34 eggs of dab and flounder, embryo ½ round; 1 egg of plaice; 16 eggs of haddock, well advanced; 3 eggs of gurnard, embryo ½ round; 36 eggs of cod and allies; 29 eggs of bib, embryo about ½ round; 20 eggs of poor-cod and whiting, all stages; 6 eggs of long rough dab, advanced.

Station I.—Surface, 20th April 1893. 4 post-larval sand-eels, 36 post-larval *Cotti*, 12 mm.; 1 post-larval pleuronectid, 7 mm.

Station IV.—Bottom, 20th April 1893. 2 post-larval *Agoni*; a post-larval *Motella*, 6 mm.

Station V.—Surface, 21st April 1893. 1 egg of haddock, well advanced; 1 egg (?) brill; 2 eggs of rockling.

Cross-Section I.—Surface, 25th April 1893. 9 eggs of gurnard, embryo about ½ round; 20 eggs of long rough dab, embryo ½ to ⅔; 16 eggs of sprat, embryo early to ½ round; 44 eggs of flounder and sprats, embryo early to ½ round; 1 egg of little sole, early, 66 eggs of dab, early to ½ round; 164 eggs (?) bib and green cod, various stages; 10 eggs of haddock, nearly round yolk; 270 eggs of cod and allies, embryo ½ round to hatching stage; 600 eggs of whiting and poor-cod, all stages

Cross-Section I.—Surface, 25th April 1893. 8 gadoids, 6·5 to 7·5 mm.; 23 *Cotti*, 7·5 to 11·5 mm.; 11 sand-eels, 10 to 13 mm.

Cross-Section I.—Surface, between Stations II. and III. 12 gadoids, 5·5 to 9 mm.; 16 sand-eels, 8 to 13 mm.; 4 clupeoids, 11 to 12 mm.; 44 *Cotti*, 7 to 12 mm.; 3 gunnels, 15 to 16·5 mm.

(No label).—4 sand-eels, 8 to 19 mm.; 2 clupeoids, 10 mm.; 2 *Cotti*, 7 mm.; *Agonus*, 6·5 mm.

Station IV.—Surface, 23rd May 1893. 7 eggs of dab, various stages; 6 eggs of sprat, early to $\frac{3}{5}$ round.

Station VII.—Surface, 24th May 1893. 17 eggs of dab, embryo about $\frac{1}{2}$ round; 13 eggs of rockling; 39 eggs mostly of sprat and whiting, early to embryo, $\frac{1}{2}$ round; 1 egg of sole; 1 egg of lesser weever; 35 eggs of poor-cod, whiting, and sprat, various stages; 1 egg like *Trachinus vipera*, but smaller.

Station VII.—Bottom, 24th May 1893. Pleuronectid, 7 mm. (long rough dab ?); 2 gobies, 2·5 to 3·5 mm.; *Agonus*, 7 mm.

Station III.—Surface, 24th May 1893. 11 eggs of dab, embryo $\frac{1}{2}$ to advanced; 31 eggs of rockling, embryo about $\frac{1}{2}$; 6 eggs of gurnard, embryo $\frac{1}{2}$ round; 2 eggs of turbot, embryo $\frac{1}{2}$; 75 eggs of flounder, early to embryo, $\frac{1}{2}$ round; about 150 eggs of whiting, poor-cod, and sprat, embryo $\frac{1}{2}$ round to $\frac{3}{5}$.

Station III.—Surface, 24th May 1893. 15 gadoids, 4·5 to 9·5 mm.; 4 clupeoids, 7·5 to 10 mm.; 1 sand-eel, 14 mm.; 8 pleuronectids, 4 to 9·5 mm., eyes lateral; 2 *Cotti*, 5 and 6·3 mm.

Station I.—Surface, 27th May 1893. 6 eggs of gurnard, embryo about $\frac{1}{2}$; 4 eggs of turbot, early; about 125 eggs of rockling, embryo mostly $\frac{1}{2}$; 7 eggs of flounder, embryo $\frac{1}{2}$; 86 eggs of whiting and poor-cod, embryo $\frac{1}{2}$ to $\frac{3}{5}$ round.

Station VIII.—Surface, 30th May 1893. 15 eggs of gurnard, embryo $\frac{1}{2}$ to $\frac{3}{5}$; 1 egg of bib, advanced; 1 egg of topknot (?); 1 egg of rockling.

Station VIII.—Surface, 30th May 1893. Gadoid, pleuronectid, 9·5 mm. eyes lateral; 5 rocklings, 5 to 5·25 mm.

Station VIII.—Bottom, 30th May 1893. 2 pleuronectids, 9 to 10 mm. eyes lateral.

Station V.—Surface, 30th May 1893. 9 eggs of whiting, embryo $\frac{1}{2}$ to $\frac{3}{5}$; 3 eggs of gurnard, embryo $\frac{1}{2}$ round; 1 egg of rockling, less than $\frac{1}{2}$ round.

Station V.—Surface, 30th May 1893. Gadoid, 16 mm.; pleuronectid, 11 mm.; 2 rockling, 5·5 and 6 mm.

Station V.—Bottom, May 30th 1893. Clupeoid, 23 mm.; *Cottus*, 6 mm.

Station VI.—Surface, May 31, 1893. 6 eggs of gurnard, embryo $\frac{1}{2}$ round; 1 egg of bib, about $\frac{1}{2}$; 1 egg of turbot; 1 egg of rockling, early.

Station VI.—Surface, 31st May 1893. 8 gadoids, 6 to 8 mm.; 13 pleuronectids, 4 to 9·5 mm.; sand-eel, 5 mm.; 33 rocklings, 3·2 to 5·2 mm.; Montagu's sucker, 8 mm.

Station II.—Surface, 31st May 1893. 6 eggs of dab, embryo $\frac{3}{5}$; 3 eggs of rockling, early; 22 eggs of flounder, early to embryo $\frac{1}{2}$ round; 48 eggs of whiting, embryo mostly $\frac{1}{2}$ round; 1 egg of gurnard, early.

Cross-Section III., North Half.—Surface, 1st June 1893. 30 eggs of rockling, embryo $\frac{1}{2}$; 10 eggs of dab, embryo $\frac{1}{2}$; 25 eggs of flounder, more than $\frac{1}{2}$ round; about 100 eggs mostly of whiting, poor-cod and sprat, about $\frac{1}{2}$ round to $\frac{3}{5}$; 1 egg of turbot, early; 5 eggs of gurnard, early.

Cross-Section III., North Half.—Surface, 1st June 1893. 5 gadoids, 9·5 to 13 mm.; 27 pleuronectids, 3 to 12·5 mm.; 11 rocklings, 4 to 5·5 mm.; 1 sand-eel, 6 mm.; 2 *Cotti*, 6 to 8 mm.; 1 lump-sucker, 10 mm.

Cross-Section III., South Half.—Surface, 1st June 1893. 7 eggs of whiting, embryo $\frac{1}{2}$ to $\frac{3}{5}$.

Cross-Section III., South Half.—Surface, 1st June 1893. 2 gadoids, 11 to 13 mm.

Station IX.—Surface, 2nd June 1893. About 300 eggs of gurnard, various stages; 15 eggs of turbot, mostly early; 37 eggs of flounder, early to embryo $\frac{1}{2}$ round; 16 eggs of whiting and sprat; about 350 eggs of rockling, various stages; 76 eggs of dab, early to advanced.

Station IX.—Surface, 2nd June 1893. Dab 12·5 mm.; 2 rocklings, 8·5 mm.

Station V.—Surface, 3rd June 1893.—3 gadoids, 8 to 11 mm.; 4 pleuronectids, 11 to 12 mm.; 4 *Cotti*, 7 to 10 mm.; 8 rocklings, 4 mm.

Station I.—Surface, 15th June 1893. Gadoid, 15 mm.; rockling, 8·5 mm.

Station III.—Bottom, 16th June 1893. 9 gadoids, 4 to 9·5 mm.; 2 clupeoids, 15 and 26 mm.; 7 pleuronectids, 4 to 10 mm.; *Cottus*, 3 mm.

Station ?—Surface, 20th June 1893. 21 gobies, 2 to 5 mm.

Cross-Section III., North Half.—Surface, 21st June 1893. 3 gadoids, 15 to 17 mm.; 1 turbot-like form, 9 mm.; clupeoid, 5·5 mm.; 13 rocklings, 4·5 to 6 mm.; lump-sucker, 23·5 mm.; 2 sand-eels, 5·5 mm.; 10 gobies, 2 to 4·5 mm.

Cross-Section II., South Half.—Surface, 22nd June 1893. Gadoid, 17 mm.; 3 rocklings, 4 to 4·5 mm.; goby, 3·5 mm.

Cross-Section II., South Half.—Bottom, 22nd June 1893. 2 pleuronectids, 8 and 15·5 mm.; rockling, 5·5 mm.

Station IX.—Surface, 14th June 1893. 12 eggs of gurnard, $\frac{1}{2}$ round to advanced; 1 egg of rockling, advanced; 1 egg of turbot, early; 1 egg of flounder, embryo $\frac{4}{5}$ round; 1 egg of poor cod, advanced.

Station I.—Surface, 15th June 1893. 5 eggs of gurnard, early to $\frac{1}{2}$ round; 12 eggs of turbot, embryo about $\frac{1}{2}$ round; 47 eggs of rockling (two species), various stages: 1 doubtful egg (·033 inch); many oil globules; 32 eggs of dab, about $\frac{1}{2}$ round.

Station VI.—Surface, 19th June 1893. 10 eggs of gurnard, early to $\frac{1}{2}$ round; 18 eggs of rockling, mostly early, some to $\frac{1}{2}$ round: 44 eggs of turbot, mostly early, some to $\frac{1}{2}$ round; 1 egg (?) lemon dab, early; 9 eggs of sprat and whiting, various stages; 7 eggs of dragonet, various stages; 16 eggs of flounder, various stages.

Cross-Section III., South Half.—Surface, 21st June 1893. 9 eggs of dragonet, embryo about $\frac{1}{2}$; 29 eggs of rockling, embryo about $\frac{1}{2}$ round; 7 eggs of dab, embryo $\frac{1}{2}$ to $\frac{2}{3}$ round; about 200 eggs of sprat, early to $\frac{3}{5}$.

Cross-Section III., North Half.—Surface, 21st June 1893. 18 eggs of dragonet, about $\frac{1}{2}$ to $\frac{2}{3}$; 31 eggs of rockling, various stages; 23 eggs of dab, embryo about $\frac{1}{2}$; 3 eggs of gurnard; 6 eggs of turbot, early; about 200 eggs of sprat and whiting, embryo $\frac{1}{2}$ to $\frac{3}{5}$ round,

Cross-Section II., South Half.—Surface, 22nd June 1893. 44 eggs of rockling, mostly early; 10 eggs of dragonet, early; 5 eggs of turbot, early; 4 eggs of dab, early to embryo $\frac{1}{2}$ round; 2 eggs of gurnard, early; 1 egg of top-knot (?); 23 eggs of dab and flounder, early to embryo $\frac{1}{2}$ round; about 100 eggs of sprat, with some whiting, early to embryo nearly $\frac{1}{2}$ round.

Vicinity of Station II.—Surface, 28th June 1893. 20 eggs of dragonet, about $\frac{1}{2}$ round; 57 eggs of rockling, mostly $\frac{1}{2}$ to $\frac{2}{3}$ round; 6 eggs of turbot, early to $\frac{1}{2}$ round; 32 eggs of dab; 58 eggs of gurnard, mostly $\frac{1}{2}$ to $\frac{2}{3}$ round; 1 doubtful egg (?) *Trachinus*, numerous oil globules; 1 egg of ling; 54 eggs of sprat, $\frac{1}{2}$ to $\frac{3}{5}$ round.

Vicinity of Station II.—Surface, 28th June 1893. 61 eggs of turbot, early, some $\frac{1}{2}$ round; 95 eggs of rockling various stages; 28 eggs of dragonet, various stages; 82 eggs of dab, mostly $\frac{1}{2}$ round to $\frac{4}{5}$; 1 egg of lesser weaver; over 100 eggs of lemon dab; 89 eggs of gurnard, mostly early; 1 egg (·04 inch diam.) many oil globules; about 200 eggs of sprat, poor cod, and whiting.

Vicinity of Station V.—Surface, 30th June 1893. 19 eggs of rockling, early to $\frac{1}{2}$ round; 1 egg of dragonet, advanced; 10 eggs of dab, various stages; 34 eggs of lemon dab, various stages; 3 eggs of sprat, embryo about $\frac{1}{2}$ round.

IV. ST ANDREWS BAY.

Station III.—Bottom, 13th January 1893. 2 eggs of rockling; 17 eggs of turbot.

Stations I., II., and IV.—Surface, 8th March 1893. 21 eggs of dab; 1 egg of haddock.

Station I., II., and IV.—Bottom, 8th March 1893. 6 eggs of dab; 2 eggs of whiting, little more than $\frac{1}{2}$ round; 2 eggs of plaice; 1 egg of long rough dab; 1 egg of haddock.

Station ?—Surface, 23rd March 1893.—2 eggs of long rough dab; 3 eggs of flounder, early; 12 eggs of dab; 1 egg of rockling. Numerous sand-eels, 3 *Agoni*, post-larval.

— . Surface, 28th March 1893. 1 egg of solenette, early stage; about 100 eggs of dab, with a few eggs of flounder, embryo in some more than $\frac{1}{2}$ round; 21 eggs of rockling, early stages; 10 eggs of long rough dab, on point of hatching; 6 eggs of haddock, embryo about $\frac{2}{3}$ round yolk; 2 eggs of cod, about same stage.

— . Surface, 14th April 1893. 2 eggs of rockling, embryo $\frac{3}{4}$ round yolk; 8 eggs of dab, $\frac{3}{5}$ round yolk; 1 egg of haddock, $\frac{1}{2}$ round yolk; 1 egg of cod, early stage.

— . Surface, 18th April 1893. 5 eggs of rockling, $\frac{3}{5}$ round yolk; 3 eggs of dab, about $\frac{1}{2}$ round; 4 eggs of whiting, $\frac{1}{2}$ round yolk; 4 eggs of cod, $\frac{1}{2}$ round; 2 eggs of haddock, $\frac{1}{2}$ round; 1 egg of long rough dab, embryo $\frac{3}{5}$ round yolk.

— . Surface, 25th April 1893. A few ova of dab, flounder, and rockling.

— . Surface, 26th April 1893. 1 egg of gurnard; 1 egg of rockling; 5 eggs of dab; 1 egg of sprat; 2 eggs of whiting; 1 egg of flounder.

— . Surface, 1st May 1893. 1 egg of gurnard; 1 egg of sprat; 7 eggs of rockling; post-larval sand-eels; 1 *Cottus* and 1 Montagu's sucker.

— . Surface, 10th May 1893. 2 eggs of gurnard; 3 eggs of dab; 6 eggs of sprat; 2 eggs of whiting, embryo well advanced; 1 egg of rockling, embryo $\frac{2}{3}$ round.

— . Surface, 16th May 1893. 2 eggs of gurnard; 4 eggs of whiting, advanced; 3 eggs of rockling; 3 eggs of sprat; 1 egg of sole, early.

— . Surface, 26th May 1893. 1 egg of sole, early stage; 2 eggs of dab, $\frac{1}{2}$ round yolk; 1 egg of sprat; 1 egg of flounder; 3 eggs of whiting, about $\frac{2}{3}$ round.

Station VII.—Surface, 7th June 1893. 8 rocklings, 5–10 mm.; 2 *Cotti*, 9 mm.

Station I.—Surface, 9th June 1893. 46 eggs of gurnard, embryo about $\frac{1}{2}$; 55 eggs of dab, $\frac{1}{2}$ to advanced; 10 eggs of sprat, early to embryo, $\frac{1}{2}$ round.

Station II.—Surface, 9th June 1893. About 50 eggs of gurnard, embryo about $\frac{1}{2}$ round; 42 eggs of flounder and dab, about $\frac{1}{2}$ round; a few eggs of rockling, advanced; 3 eggs of turbot, embryo about $\frac{1}{2}$; 15 eggs of sprat, embryo more than $\frac{2}{3}$ round.

Station III.—Surface, 9th June 1893. Very few ova, mostly advanced gurnard and dab.

Station III.—Bottom, 9th June 1893. A few dead ova; 5 eggs of gurnard; 6 eggs of dab and flounder.

Station IV.—Surface, 9th June 1893. 15 eggs of gurnard, mostly far advanced ; 10 eggs of dab, about $\frac{3}{5}$; 14 eggs of sprat, early to embryo $\frac{1}{2}$ round ; 16 eggs of flounder, advanced ; 5 eggs of rockling, embryo $\frac{3}{5}$ to $\frac{4}{5}$; 5 eggs of turbot, embryo $\frac{1}{2}$.

Station IV.—Bottom, 9th June 1893. A few dead ova ; 2 eggs of gurnard, and 5 eggs of dab, early stages.

V. ABERDEEN BAY.

Station VI.—Bottom, 7th September 1892. Clupeoid (herring), 10 mm. ; pleuronectid, 8 mm. ; dragonet, 6 mm.

Station II.—Surface, 8th September 1892. Montagu's sucker, 9 mm.

Station II.—Bottom, 8th September 1892. Pleuronectid, 12 mm. ; eye on ridge.

Stations III. and IV.—Surface, 9th September 1892. 4 large unknown eggs, embryo far advanced.

Station IV.—Bottom, 9th September 1892. 8 clupeoids, 8·5 to 14 mm. ; 2 dragonets, 4·5 to 6 mm.

260 miles E. by N. of Aberdeen, 11th March 1893. Haddock in great numbers ; majority nearly ready for hatching ; long rough dab, a few, about $\frac{2}{3}$ round the yolk-sac ; 2 eggs of cod, embryo completely round yolk-sac.

Station I.—Surface, 16th May 1893. 9 pleuronectids, 10 mm. (eye lateral) to 12 mm. (eye on ridge) ; 1 gadoid, 6 mm. ; 2 *Cotti*, 8 mm. ; Montagu's sucker, 8 mm.

Station II.—Surface 16th May 1893. 5 eggs of gurnard, embryo $\frac{1}{2}$ round ; 1 egg of rockling, embryo $\frac{1}{2}$ round ; 6 eggs of dab ; 27 eggs of poor-cod, whiting, and sprat.

Station II.—Surface, 16th May 1893. 18 pleuronectids, 12–15 mm., eye on ridge ; gadoid, 6 mm. ; 2 *Cotti*, 8·5 and 17 mm.

Station II.—Bottom, 16th May 1893. 3 gadoids, 4 mm., 6·5, and 7 mm. ; 2 pleuronectids, 11·5 mm. to 13 mm. (same as at surface, with eye on ridge).

Station III.—Surface, 16th May 1893. 7 pleuronectids, 10·5 to 12·5 mm., eye near or on ridge ; gadoid, 6·2 mm.

Station III.—Surface, 17th May 1893. 1 egg of dragonet, embryo about $\frac{1}{2}$; 1 egg of cod, advanced ; 11 eggs of sprat, early to embryo, $\frac{1}{2}$ round.

Station IV.—Surface, 17th May 1893. Pleuronectid, 11 mm., eye on ridge.

Station V.—Bottom, 17th May 1893. 67 pleuronectids, 10 to 12·5 mm., eye on ridge as before ; gadoid, 6·2 mm. ; lump-sucker, 5 mm.

Station VII.—Surface, 17th May 1893. 5 eggs of rockling, embryo $\frac{1}{2}$ round ; 1 egg of gurnard ; 5 eggs of whiting, early to embryo $\frac{1}{2}$ round.

Aberdeen.—Surface, 23rd June 1893. Great number of ova, mostly gurnard at all stages, from embryo $\frac{1}{3}$ round to hatching stage ; a few eggs of poor-cod, mostly advanced ; an unknown ovum (C.), same size as gurnard, yellow pigment, but no oil-globule ; a few eggs of rockling, two species ; 1 or 2 eggs of dab ; 1 egg of dragonet, embryo about $\frac{1}{2}$ round yolk.

VI.—ON THE RATE OF GROWTH OF CERTAIN MARINE FOOD-FISHES. By H. CHARLES WILLIAMSON, M.A., B.Sc., Fisheries' (Woodall) Prizeman, University of St Andrews.

Mr J. T. Cunningham, M.A., of Plymouth Laboratory, has published several papers upon the rate of growth of sea-fishes.* He gives the measurements and the calculated ages of a number of the young forms of the following species,—*Pleuronectes flesus*, *P. limanda*, *P. platessa*, *P. microcephalus*, *Solea vulgaris*, *Solea lascaris*, *Solea lutea*, *Solea variegata*, *Rhombus maximus*, *Rhombus laevis*, *Arnoglossus laterna*, *Gadus merlangus*, *Gadus pollachius*, *Gadus luscus*, *Gadus minutus*, *Zeus faber*, *Gadus morrhua*, *Zeugopterus punctatus*, *Scomber scomber*, *Clupea sprattus*, *Clupea pilchardus*, *Engraulis encrasicholus*, *Clupea alosa*, *Clupea finta*, *Gadus æglefinus*, with notes on *Motella mustela*, *Mugil chelo*, *Clupea harengus*, *Osmerus eperlanus*, *Anguilla vulgaris*, *Agonus cataphractus*, *Cottus bubalis*, *Callionymus lyra*, *Gobius minutus*, *Syngnathus acus*.

Many of these have been treated very fully. The following notes are, for the most part, upon fishes not described by Mr Cunningham. Two forms, however, the dab and lemon dab, have been examined by him, the former very fully, the latter briefly.

The specimens here mentioned are those preserved at the Marine Laboratory and the University Museum, St Andrews. The contraction due to the spirit has been neglected. The sizes of several mentioned in the tables were obtained from the notes of Professor M'Intosh.

An attempt has been made to indicate a greater uniformity in the growth of different individuals of the same species, by keeping carefully in view the long period over which spawning in many cases takes place. It is, of course, unlikely that all the specimens got in any particular haul were hatched on the same day or even in the same month. Among the specimens of each form examined the greatest variation in this respect, within the limits of the spawning period, is taken for granted.

It is probable that among the majority, or even the great majority, of individuals belonging to the same species, the rate of growth is fairly uniform under natural conditions; and assuming this to be the case, the measurement of a large number of specimens taken at different times should, when considered in connection with the duration of the spawning period, give a pretty accurate indication of the average rate of growth of that species.

This is what I have attempted to do in this paper, so that it may be possible from the size of a fish to fix its approximate age.

THE DAB.

(*Pleuronectes limanda.*)

The 'Garland' found eggs of the dab in March, April and May during 1892. They were obtained in greatest number in April. Spawning may, however, go on until the middle of June (M'Intosh).

Among the specimens preserved at St Andrews, there are four ranging in size from 14–to 17·5 mm., which were obtained in January. At the greatest possible age, these dabs would be about ten months old, *i.e.*, if they were spawned in March. They may not be more than seven months old, spawning having probably taken place in June. Cunningham makes no mention of any specimen caught in January. A large number of dabs whose lengths vary from 20–52 mm., were caught on 4th March 1892. These must be at least nine months old, if we suppose that they were spawned at the end of the spawning season, June. The largest dab (52 mm.) may be older than that. It may be even ten or eleven months. The specimen captured on 2nd October 1887, measured 49 mm., and must be, at least, four months old, if we suppose it spawned in June. It may, however, be seven months old; it is not likely to be any older. Cunningham is of opinion that a dab just over a year old, may be as small as 45 mm. (1·8 inches), (*Jour. Mar. Biol. Ass.*, Vol. II. No. 2, p. 101). A dab, 70·5 mm. long, was caught on 11th September 1889; this example must be, at least, one year and three months old. The specimen 71·5 mm. long, obtained in June, may also be one year and 3 months old, although it may be younger. One dab trawled in October, was 70 mm. long, and could not be less than one year and four months old. 70 mm. may be taken as pretty near the average length of the dab when one year and three months old. If this be so, the size of a dab a year old is roughly between 60 and 70 mm. (2·4–2·8 inches).

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* *Journ. Marine Biol. Association.*

Date of Capture.	No. of Specimens.	Sizes in Millimetres.	Calculated Age.	Month when Spawning may be supposed to have taken place.	Locality.
Apr. 16, 1887	1	13	About 1 month	March	
Jun. 8, 1891	1	10	,, ,,	May	Vicinity of Stat. I., Forth.
,, , 1889	1	32	,, 3 months	March	St Andrews Bay.
,, 7, 1888	4	36 : 37·5 : 40 : 42	,, ,,	,,	,, ,,
July 5, 1888	2	48·5 : 59	,, 4 ,,	,,	,, ,,
Sept. 11, 1889	3	46 : 49·5 : 53·5	,, 5 and 6 months	April	Eden Seine net.
Oct. 2, 1887	1	49	,, 5 months	May	Trawl N. of Pier, St Andrews Bay.
,, 10, 1891	1	11	,, 4 ,,	June	Forth.
Jan. 19, 1892	4	14 : 14·5 : 17·5 : 17·5	,, 7 ,,	,,	Forth, Stat. II.
Mar. 4, 1892	21	20–52	,, 9 ,,	,,	Bottom net, after storm.
Apr. 26, 1888	1	25	,, 10 ,,	,,	St Andrews Bay.
Jun. 7, 1888	1	71·5	,, 1 year + 3 months	March	,, ,,
Sept. 11, 1889	5	70·5	,, ,, ,,	June	Seine net, Eden.
		80 : 86	,, ,, +4 ,,	May	
		105 : 106	,, ,, +5 ,,	April	
Oct. 2, 1887	1	70	,, ,, +4 ,,	June	Trawl N. of Pier, St Andrews.
From last week in April to 1st week in May (inclusive) 1893	2	146 : 148	,, 2 years	May or April	Moray Firth, S.S. Garland.

Cunningham considers the dabs, 10·5 and 17 mm. long, caught on 14th June 1890, and 25th June 1889 respectively, three months old (*Jour. Mar. Biol. Ass.*, Vol. II. No. 2, p. 100). A large number of dabs got in Whitsand Bay on 17th June 1890 measured over 30 mm., and a number of specimens obtained at St Andrews in June, also measured over 30 mm. The former specimens he considers three months old; the average size at three months appears then to be a little over 30 mm. To a dab captured in the Humber on March 30th 1892 (*Jour. Mar. Biol. Ass.*, Vol. II. No. 4 p. 352), which was 20 mm. long, Cunningham assigns the age of six weeks. Others captured at the same date and varying in size from 32–51 mm., were thought to be ten months old. In the St Andrews collection there are 21 dabs which were caught on 4th March 1892, which correspond almost exactly with those caught in the Humber on 30th March 1892. They vary in size from 20–52 mm., while the Humber specimens vary from 20–51 mm. The individual sizes of these former dabs, the St Andrews specimens, are, 20 : 20 : 21 : 21·5 : 21·5 : 22 : 22 : 24 :

24·5 : 25 : 25 : 27 : 27·5 : 30 : 30 : 34 : 34 : 35 : 37·5 : 43 : 52 mm. A dab 10 mm. long was got in the Forth on 8th June 1891. If these specimens mentioned by Cunningham, 10·5 and 17 mm. long, are three months old, they must have been exceptionally slow in growth, and it is not likely that such aberrant individuals would be common. But they must be comparatively common—as one dab 10 mm. long was got in the Forth in June 1891 and Cunningham records several specimens between that size and 20 mm. It is peculiar that in the cold months of February and March, the dab in the Humber managed in six weeks to reach the size of 20 mm., while those got near Plymouth in June, only measure 10·5 and 17 mm., and are supposed to be three months old. It is more reasonable to suppose that these small specimens (the latter two 10·5 and 17 mm.) instead of being spawned in March had been spawned in April or May, and were thus between one and two months old. The specimen got in the Humber, 20 mm. long, is likely to be far more than six weeks old.

In the table of sizes given above there are two distinct series. One of these begins with 16th April 1887, and runs on to 2nd October 1887. It starts with a specimen 13 mm. long, and ends with one 49 mm. long. The second series commences with 10th October 1891, and extends to 2nd October 1887. Beginning with a dab 11 mm. long, it is continued through January, March, April, with the sizes, 14, 20 &c., 25 mm. It is represented in September and October by the two specimens 71·5 and 70 mm. respectively. If spawning had taken place at the end of September or beginning of October, the small sizes of the other specimens in the second series would be accounted for. It is difficult otherwise to account for the great aberrancy in growth presented by the second series. The dab 71·5 mm. long caught on 7th June 1888 apparently belongs to the first series, as likely do the specimens 105 and 106 mm. long, captured in September. The dabs 70·5 and 70 mm. obtained in 11th September and 2nd October may be referred to the second series. The specimen 52 mm. long got on 4th March 1890 might be included in the first series. The members of the second series are comparatively small, but they have had the winter months to contend with. There is, however, no evidence of spawning taking place at the end of September, so that the ages of these specimens have been calculated from the known spawning period.

THE GREY GURNARD.

(*Trigla gurnardus.*)

The spawning period of this form extends from April to August, both inclusive. The eggs were not got by the s.s. 'Garland' (1892 Report) in very great abundance in April and August. They were more common in May, even more so in June, and were obtained in largest quantity in July (Station VIII., Forth). The eggs of the gurnard have been found by Mr Scott, of the 'Garland,' in January. 'The embryos are hatched in from 'six to seven days, according to the temperature, after fertilisation of the 'eggs. The embryos, when five days old, measure 4·125 mm. In the 'following June the young gurnards appear to reach the length of 68·7–'75 mm. (2¾–3 inches), though others range to 118 and 162 mm. (4¾ 'and 6½ inches). Some even reach the length of 103–153 mm. (4⅛–'6⅛ inches). It is probable that all these may be included in the season's 'growth' (M'Intosh and Prince, 'Development of Teleostean Food-'Fishes,' &c.).

'On September 12th, specimens were caught about 43·7 mm. (1¾ inch), 'which are probably the young of the first season, while some appear to 'be those of the following season. They vary considerably in size. Of 'those captured here (St Andrews), the smallest occur in July' (M'Intosh).

Date of Capture.	No. of Specimens.	Sizes in Millimetres.	Calculated Age.	Month when Spawning may be supposed to have taken place.	Locality.
Jun. 26, 1889	1	7	Under 1 month.	End of May or beginning of June	Mid-water net, St Andrews Bay.
Jul. 17, 1890	1	15	About ,,	June	Bottom net, St Andrews Bay.
Aug. 23, 1886	1	13	,, ,	July	St Andrews Bay.
,, 30, 1886	6	6 : 8·5 ; 9·5 ; 10·5 ; 10·5 : 10·5	Under	End of July or beginning of August	S.E., Isle of May, 15 miles, 'Garland.'
,, ,, ,,	5	14 : 14·75 : 14·9 : 17 : 19	Between 1 & 2 months	July	,, ,, ,, ,,
,, ,, ,,	2	20 : 21·8	About 2 months	June	,, ,, ,, ,,
,, 28, 1886	1	23·4	Between 2 & 3 months	,,	St Andrews Bay.
Sept. 20, 1888	1	10·75	About 1 month	August	Mid-water net, St Andrews Bay.
,, ,, 1889	1	12	,, ,,	,,	Mid-water net, St Andrews Bay, 2 miles off Castle.
* ,, 12, 1887	1	43·7	,, 4 months	May	Mid-water net, St Andrews Bay.
Oct. 29, 1891	1	30	,, 3 ,,	July	Largo Bay.
Nov. 29, 1889	1	57	,, 6 ,,	May	St Andrews Bay.
*May	1	103	,, 1 year	,,	,, ,,
June 1884	1	75	,, 10 months	August	,, ,,
,, 17, 1885	1	78	,, ,,	,,	,, ,,
* ,, 7, 1888	6	53 : 70 : 71 : 74 91 : 96	,, 10 months ,, 11–12 months	August July	Trawl, St Andrews Bay. ,, ,, ,, ,,
,, 6, 1884	1	115	,, 1 year+1 month	May	Aberdeen B., 13–20 fms.
,,	1	118·8	,, ,, ,,	,,	St Andrews.
Jul. 3, 1884	1	84	,, 11 months	August	Off Scarboro'.
,, 5, 1888	4	77 : 83 : 87 : 90	,, 11–12 months	July & Aug.	St Andrews Bay.
,, 21, 1884	9	*87 : *91 : *93 : *100; 104 : 105 : *106 : 110 : *115	,, 11-13 ,,	June, July, & August	Trawler, St Andrews Bay
Aug. 22, 1884	4	87 : 87 ; 90 : *100 : 108	,, 1 year	August	St Andrews Bay.
*April	2	150 171·8	,, ,, +9 months ,, 2 years	July April	Trawl.
May 1, 1884	1	162	,, ,,	May	St Andrews Bay.
* ,, 2, 1884	1	160	,, ,,	,,	,, ,,
*June	1	162	,, ,,	June	,, ,,
Jul. 22, 1884	1	152	,, ,, +11 m'ths	August	Trawler.
,, 21, 1884	1	185	,, 2 years	July	Trawler, St Andrews Bay
May 12, 1893	2	231 264	,, 3 ,, ,, ,, +9 m'ths	May or June ,, or Aug.	Fishing boat, St Andrews ,, ,, ,, ,,
,, 24, 1893	1	274	,, ,, +10 m'ths	July	,, ,, ,, ,,

* Sizes given in Professor M'Intosh's Notes.

On 22nd August 1884, four gurnards, varying in size from 87 to 108 mm. (87 : 87 : 90 : 108) were captured in St Andrews Bay. These are at least one year old, as spawning is not known to go on after August. The average of these sizes may fairly be taken as the average year's growth. The largest, 108 mm., is likely over a year. The size of the year-old gurnard may then be supposed to be roughly about 90 mm. In July 1884 and 1888, specimens, ranging from 77 to 115 mm., were obtained in St Andrews Bay. The age of the smallest of these is perhaps eleven months, having probably been spawned in the previous August; while the largest, 110 and 115, would appear to be thirteen months old, having possibly been spawned in June of the previous year. The gurnard, whose size is about 90 mm. (3·6 inches), may be taken as a year old.

Gurnards, ranging in size from 53, 70–96, were captured in June. The smallest is, at least, ten months old, but is not likely to be any older. The largest, 91 and 96, are probably about one year old. A specimen, 57 mm. long, was caught on 29th November 1889. This is, doubtless, the young of that year, and may be supposed to be five or six months old. This would make the month when spawning probably took place May or June. The gurnard, measuring 103 mm., captured in May, must be about one year old. The two examples taken in June, which were 115 and 118·8 mm. long, respectively, should not be considered less than thirteen months. The average size of all the preserved specimens (except one 162 mm. long), which were caught in June, is 84 mm. The gurnard, 162 mm. long, is almost double that size, and is too large to be considered only one year old. The specimens captured in July 1884, measuring 152 and 185 mm. respectively, must be at least one year and eleven months old. The examples obtained in May 1884, which measured 160 and 162 mm. respectively, are at least one year and nine months old, if it is supposed that they were spawned in August, but may be two years old. One gurnard 162 mm. long was caught in June. This fish must be at least one year and ten months, but may be as old as two years, or even more. The size of the gurnard at the age of one year and eleven months may be fairly considered about 152 mm. 160 mm. (6·4 inches) would then be approximately the size reached in two years. The increase in length during the second year may therefore be taken at about 70 mm. (about 3 inches). The specimen 150 mm. long captured in April 1884 is at least one year and nine months if it was spawned at the end of the spawning season, but it may be one year and eleven months old if spawning be supposed to have taken place in May. On 12th May 1893 a specimen 231 mm. (9·2 inches) long was obtained, which is probably at least two years and nine months, but which may not unreasonably be reckoned two years and eleven months. Another gurnard got on that date (12th May 1893) measured 264 mm., and is likely to be about four years old.

THE LING.

(*Molva vulgaris.*)

The s.s. 'Garland' found the eggs of the ling during the months of April, May, and June. The eggs preserved at the Marine Laboratory, St Andrews, were obtained on 26th April 1886, 8th May 1886, 21st May 1885. 'The eggs were hatched in nine days, after fertilisation at the 'Marine Laboratory' (M'Intosh and Prince, 'Development of Teleostean 'Food-Fishes,' &c.).

The ling, 76·5 mm. long, captured in December 1884, was found in sand pool, and the specimen, 76 mm., obtained in March 1888, was got in a rock-pool at St Andrews. The former specimen, 76·5 mm. long, is the young of that year, and may be reckoned seven months old or perhaps a month more, spawning having probably taken place in May. The latter specimen, that captured in March, must be at least nine months old, since spawning is not known to go on after June. From its size, this ling is not likely to be any older. Two examples, measuring respectively 151 and 167 mm., were trawled by the s.s. 'Garland' in the Moray Firth in the beginning of May. These must be under fourteen months old, as spawning begins in March. A ling obtained in September 1885 was 187·5 mm. long. This fish must be one year and three months old at least, since spawning ceases in June. The two specimens captured in May, therefore (151 and 167), are very probably just a year or thirteen months old. In June 1884, an example was caught which measured 266 mm. Its age most probably is at least two years. The specimen got in September 1884, 278 mm. long, is probably at least two years and three months old. A ling, 375 mm. long, was captured in April 1884, which might be three years, but is more likely to be two years and eleven months old.

Date of Capture.	No. of Specimens.	Sizes in Millimetres.	Calculated Age.	Month when Spawning may be supposed to have taken place.	Locality.
May 6, 1886	3	1 : 2	1 day (known age)	End of April	Marine Lab., St Andrews. Eggs from Anstruther.
„ 10, 1886	A number	1·25 – 2	1 or 2 days	„ „	„ „ „ „
„ „ „	2	2·25	2 or 3 days	„ „	„ „ „ „
July 21, 1887	1	16	About 2 months	May	s.s. 'Garland,' S.E. Isle of May
„ „ „	2	18·7	„ „ „	„	„ „ „ 22 fms.
*Aug. 30, 1886	A number	8·5 – 9	„ „ „	June	„ „ „
„ 31, 1886	1	10	„ „ „	„	„ „ „
„ „ „	1	20	„ 3 „	May	„ „ „
Dec. 1884	1	76·5	„ 7 „	„	Sand Pool, St Andrews.
Mar. 1888	1	76	„ 9 „	June	Rock Pool, „ „
During last week of April and first week of May 1893		151 : 167	„ 1 year, and 1 year+1 month	April	Moray Firth, s.s. 'Garland.'
Sept. 1885	1	187·5	„ 1 year+4 months	May	St Andrews Bay.
†June 24, 1884	1	266	„ 2 years+1 month	„	Liner.
Sept. 1884	1	278	„ „ +4 months	„	St Andrews Bay.
†April (end of) 1884.	1	375	„ „ +11 „	„	Trawler, Trawling Commission.
†June 1884	1	380	„ 3 years	June	Liner.
May 1884	1	398	„ „	May	Off St Abb's Head, Trawling Commission.

* M'Intosh and Prince.
† Sizes given in Prof. M'Intosh's Notes.

THE WOLF-FISH.

(*Annarrhichas lupus.*)

The wolf-fish probably spawns in December, January, February, and March (M'Intosh). The eggs preserved at the Marine Laboratory, St Andrews, were got on 17th, 18th, and 30th January 1886, 3rd February 1886, 24th and 30th March 1886. 'Hatching took place at the 'Marine Laboratory, St Andrews, about eight days after collection. The 'embryos on emergence were about 11 or 12 mm. long' (M'Intosh and Prince). The eggs are demersal. The time of incubation is unknown, but it probably extends over a considerable period.

None of the wolf-fishes which were trawled had yolk-sacs. The smallest of these was 17 mm. long. Of those which were hatched and kept in the tanks at St Andrews, none had completely absorbed their yolk-sacs until the length of 23 mm. was reached. The young wolf-fishes in the sea then seem to absorb their yolk-sacs sooner than those bred in captivity.

Owing to the want of specimens between the wolf-fish 24 mm. long, and that 140 mm. long, it is difficult to fix the size of this form when one year old. One specimen, 156 mm. long, was captured in July. This example must be at least one year and four months if we suppose that it was hatched in March. In February, two wolf-fishes which measured 140 and 156 mm. were got off the Fife Coast. The specimen, 156 mm. long, may be fairly reckoned over one year. The wolf-fish, which is 140 mm. long, could not be less than ten months old, but may be one year old. The specimen, 137·5 mm. long, captured in July, is at least one year and four months. It is probably small for its age. About 140 mm. may therefore be taken as about the length reached in one year.

Date of Capture.	Number of Specimens.	Sizes in Millimetres.	Calculated Age.	Month when Hatching may be supposed to have taken place.	Locality.
Jan. 23, 1885	5	9 : 10 : 11 : 11 : 11	Recently hatched (known age)	January	Marine Laboratory, St Andrews.
„ 24, 1893	large number	18–18·5–19–20	Over 1 month	December	5 miles off the May.
Feb. 18, 1886	3	11·25 : 12 : 12	A day or 2 (known age)	February	Marine Laboratory, St Andrews.
„ 21, 1890	1	24	Between 1 and 2 months	December	Surface net, Firth of Forth.
Mar. 16 and 17, 1886	2	13·5 : 14	Under 1 month	February	Marine Laboratory, St Andrews.
April 8, 1886	1	17	„ „	March	„ „ „ „
„ 18 and 26, 1886	6	19 : 20 : 20 : 21 : 22 : 22	About 1 month	February	„ „ „ „
April 20, 1886	2	19 : 21	Free for a fortnight (known age)	April	„ „ „ „
„ „ „	1	20	Newly hatched (known age)	„	„ „ „ „
May 1, 1886	2	21 : 22	About 1 month	End of Mar.	„ „ „ „
„ 3, 1886	2	22 : 23	„ „	„ „	„ „ „ „
„ 7, 1890	3	19 : 20 : 20	Between 1 and 2 months	March	Bass, W. by N., 10 miles, 'Garland.'
„ 22, 1886	1	22	About 1 month	April	Marine Laboratory, St Andrews.
*February	2	140 156	„ 1 year „ „ +1 month	February January	Off Fife Coast.
*July	1	137·5	„ „ +4 months	March	„ „
„ 11, 1885	1	156	„ „ +4 „	„	St Andrews Bay.
Aug. 1885	1	181	„ „ +6 „	February	„ „
*Mar. 1886	1	203	„ 2 years	March	Off Fife Coast.
* „ 3, 1886	1	243	„ „ +2 „	January	„ „
*July	1	225	„ „ +4 „	March	„ „
August	1	236	„ „ +4 „	February	„ „
*May 1885	1	296	„ „ +5 „	December	„ „
Mar. 25, 1886	1	437	„ 4 „ +1 month	February	St Andrews Bay.
*August	1	450	„ „ +5 months	March	Off Fife Coast.
*September	1	450	„ „ +6 „	„	„ „

* Sizes given in Professor M'Intosh's Notes.

The Lemon Dab.

(*Pleuronectes microcephalus.*)

The ova of the lemon dab, preserved at St Andrews, were obtained in May, June, July, and August. They were found in greater abundance in June and July, and of these two, July was the month in which the larger number of ova were got. Many embryos were hatched at the Marine Laboratory, St Andrews, on 15th July 1890, from ova received from Newhaven.

The age of the specimen 25 mm. long, captured on 7th May 1890, is very doubtful. From its length it is not likely to be less than about two months. If it is that age, it must have been spawned some time in March. There is no evidence of spawning taking place in March. Its age must therefore be calculated from July or August (the end of the spawning season), of the preceding year. If it is supposed that it was spawned in August, its age will be about nine months. This specimen must then have been excessively slow in growth. On 27th April 1889, a lemon dab was caught at St Andrews, which was only 9·75 mm. in length. That specimen could not be much over a month old. The fact that a specimen, 25 mm. long, was captured in May, and the above specimen, 9·75 mm. long, in April, points to the probability of spawning taking place earlier than May. It is not easy to fix the length of the lemon dab when a year old. Cunningham, in the *Journal of the Marine Biological Association*, (Vol. II., No. 2), thinks that a lemon dab captured in November 1890, measuring 150 mm., must be over a year old. He considers its age to be one year and five months, from which it may be inferred that it was probably spawned in June. A lemon dab, 150 mm. in length, was

Date of Capture.	No. of Specimens.	Sizes in Millimetres.	Calculated Age.	Month when Spawning may be supposed to have taken place.	Locality.
Apr. 27, 1889	1	9·75	About 1 month	April	Bottom trawl tow-net, St Andrews Bay.
Jun. 10, 1889	2	6·75 : 8	,, ,, ,,	May	,, ,, ,, ,,
,, 17, 1889	1	9	,, ,, ,,	,,	Bottom net, St Andrews Bay.
,, ,, 1892	2	3 : 4·5	A few days	June	160 miles off Aberdeen.
,, 28, 1889	1	9·5	About 1 month	May	Trawl tow-net.
July 3, 1891	1	13	,, 2 months	,,	Bottom net.
,, 17, 1890	6	3 : 3 : 3 : 4 : 5½ : 5½	Two or 3 days	July (hatched July 15, 1890)	Mar. Lab., St Andrews (eggs from Newhaven).
,, 18, 1890	2	3 : 4	A few days	,,	,, ,, ,, ,,
,, 19, 1890	1	4	,, ,,	,,	,, ,, ,, ,,
,, 20 & 21, 1890	3	3 : 3 : 5	,, ,,	,,	,, ,, ,, ,,
,, 21, 1887	2	13 : 15·5	Between 1 and 2 months	June	Off Isle of May.
,, 26, 1890	13	3 : 3 : 3 : 3 : 3·5 : 3·5 : 4 : 4 : 4 : 4·5 : 4·5 : 5 : 5	Under a fortnight	July	Mar. Lab., St Andrews.
,, ,, ,,	1	4	,, ,, ,,	,,	,, ,, ,, ,,
,, 27, 1890	1	2	A few days	,,	,, ,, ,, ,,
Aug. 1, 1890	2	4 : 4·5	Under a fortnight	,,	Surface, St Andrews.
,, 9, 1892	1	5·5	About a fortnight	,,	Bottom tow-net, Bell Rock trawling ground.
,, 30, 1886	4	10 : 10 : 11 : 13	,, 1 month	,,	Tow-net, s.s. 'Garland.'
,, 1886	9	8 : 8 : 8·5 : 9 : 9·5 : 10 : 11 : 11 : 15	From 1 to 2 months	June & July	Off Isle of May.
,, 21, 1891	2	*3·5 : 6·5	Under 1 month	Beginning of August	Off Elie, 12 fathoms.
,, 22, 1890	1	7	,, ,, ,,	August	Surface, St Andrews Bay.
,, 29, 1891	1	2·25	A few days	,,	St Andrews Bay.
Sept. 18, 1888	1	9	About 1 month	,,	Mid-water net, St Andrews Bay.
Oct. 1, 1891	1	10·5	Little over 1 month	,,	Bottom, Station V., Forth
,, 25, 1891	1	15	About 2 months	,,	Bottom, Station VIII., Forth.
May 7, 1890	1	25	,, 9 ,,	,,	Surface, Bass, W. by N., 10 miles.
*Aug. 20, 1884	2	133 : 137	,, 2 years	August	Trawler, Trawling Commission.
*Jan. 1884	1	150	,, ,, +5 months	August	Trawling Commission.
*Feb. 1891	1	159	,, ,, +6 ,,	,,	St Andrews.
*Apr. 1884	1	168	,, ,, +8 ,,	,,	From trawler, Trawling Commission.
*July 21, 1884	1	155	,, ,, +2 ,,	May	,, ,, ,, ,,
*Aug. 15, 1884	1	172	,, ,, +3 or 4 m'ths.	,,	,, ,, ,, ,,
,, 20, 1884	2	154 : 156	,, ,, +2 months	June	,, ,, ,, ,,
*May 1884	2	180	,, 2 ,, +10 ,,	July	Off St Abb's Head, Trawling Commission.
,, ,, ,,		183	,, 2 ,, + ,,	,,	Firth of Forth, Trawling Commission.
Aug. 14, 1884	1	198	,, 3 years	August	St Abb's Head, Trawling Commission.
* ,, 15, 1884	1	208	,, ,,	,,	From trawler, Trawling Commission.
*May 2, 1884	1	218	,, ,,	May	St Andrews Bay, Trawling Commission.
*July 1884	1	225	,, ,, +1 month	,,	Trawling Commission.
*Aug. 15, 1884	2	237 : 240	,, ,, +2 or 3 months.	June or July	From trawler, Trawling Commission.
*Feb. 1884	1	253	,, 3 years 6 months	August	Off Haddington coast, Trawling Commission.
,, 17, 1884	1	260	,, ,, ,, ,,	,,	Off St Abb's Head, Trawling Commission.

* Sizes given in Professor M'Intosh's Notes.

caught in January 1884. This specimen must of necessity be at least one year and five months old, but is probably 2 years and 5 months. On 21st July 1884, one which measured 155 mm. was obtained. The age of this individual must be at least one year, and perhaps is about two years and one or two months. The latter age is the more likely. There are no preserved specimens to fill up the great gap between the specimen 25 mm. long and those captured in August, 133 and 137 mm. long. The lemon dabs, measuring respectively 154, 156, and 172 mm., caught in August, are probably about two years old. The specimens, 133 and 137 mm. long, trawled in August, are at least one year old, but may be two years old. 133 mm. (5·3 inches) appears to be too great a size to be reached by the lemon dab in one year. The length of this form when one year old is not therefore likely to be more than 90 mm. (3·6 inches). The examples 180 and 183 mm. respectively, captured in May, may be reckoned about two years and nine months old; and the specimens 198 and 208 mm. obtained in August probably are about three years.

VII.—ON THE DEVELOPMENT OF THE PLAICE (*Pleuronectes platessa*). By J. H. FULLARTON, M.A., D.Sc., F.R.S.E. (Plates XIII.-XVI.)

PART II.

In the Ninth Annual Report,* I gave a general account of the development of the plaice, as exhibited by mounted preparations of whole embryos, and now propose to give some of the results of my investigation† into the origin of the liver, heart, and renal organs, and the changes that take place in these before the absorption of the whole of the yelk. In my preliminary communication I pointed out that the larvæ hatched in sixteen and a half days after the fertilization of the ova. This period, as well as the prolonged time taken between the extrusion of the embryo and the absorption of the yelk, permit of a greater number of stages being obtained than would otherwise be the case if the temperature of the sea-water were higher.

The first indication of the liver appears in the embryo of the ninth day after fertilization, immediately behind the auditory vesicle. Lereboullet‡ in dealing with the development of the trout, perch, and pike, says:—'*On remarque, contre la paroi extérieure de cette ampoule gastrique, une accumulation de cellules, premier indice du foie.*' In the plaice no such *ampoule* is discernible at this stage, as the digestive tube maintains a fairly uniform calibre for some distance from the origin of the liver, both anteriorly and posteriorly. The cells of the ventral surface of the intestine proliferate, as is shown (fig. 1, *lr.*) from the increase of the nuclei, which are three, and in some places four, rows deep on the under portion, whereas the dorsal portion is only a single layer of cells thick. Coincident with this multiplication of nuclei, the size and shape of the ventral cells—which at first were regularly columnar like those of the upper surface—are considerably altered, though the prevailing columnar shape obtains for some time. The thickened ventral portion of the intestine forms the ventral wall of the intestinal tube and the liver, and the transverse horizontal diameter of the lumen of the gut becomes greater than the transverse vertical diameter. This is the only change that takes place in the gut at this stage, or till fully a day afterwards. The liver is separated from the yelk by a very thin layer of hypoblast (*hy.*). Vogt§ describes the liver of the salmon at first as '*un amas arrondi de cellules, adhérant, d'une part a l'élargissement de l'intestin, et, d'autre part, au vitellus.*' No widening or *élargissement* is noted in the plaice, and the liver certainly is not adherent to the vitellus, for a thin but distinct layer of cells intervenes between it and the latter. Probably the *ampoule* of Lereboullet, and the *elargissement* of Vogt, refer to a later stage, for it is very difficult, without a study of sections, to determine the earliest appearance of the liver, or of the cells that go to form the liver.

The intestine widens in embryos about a day further advanced, but the widening is morphologically different from that described by Lereboullet,§ who says in reference to the intestine:—'*le tube se renfle en une ampoule qui constitue le rudiment de l'estomac.*' In fig. 2, the first widening that is noticed is posterior to the invagination (*d.c.*) beginning to extend into the liver (*lr.*). If this widening is the rudiment of the stomach, then either the invagination is not the ductus choledochus, or the opening of this duct must shift further backward, so that the relative position of stomach and opening of duct may become normal. That the invagination is the beginning of the ductus choledochus is proved by a series of sections in older embryos (*cf.* figs. 4, 5, 7, and 15, *d.c.*), and no evidence is afforded by examination of my sections that the unlikely alternative of a change of relative position is true. I can only conclude, therefore, that Lereboullet, as well as Vogt, is describing a condition that only obtains when the liver is partially separated from the ventral wall of the intestine; certainly such a description does not hold good for the plaice. Vogt's figure, 142, in Table V., showing the *élargissement*, seems to be taken from an embryo even more advanced than that represented in fig. 4 of my plate. The invagination of the ductus choledochus, which in fig. 2 is shown as a slight depression in the wall of the intestine adjoining the liver, becomes deeper as the liver is being separated from the intestinal wall, so that in fig. 4 it extends in a curved manner into the substance of the liver. While this has been taking place, the ventral protuberance assumes a more pronounced form, and the liver pushes against the yelk-sac underneath. The first differentiation of the organs—liver and intestine—from one another, is indicated anteriorly (fig. 3) where the columnar cells of the intestine are sharply marked off from the cells of the liver. This division of liver and intestine anteriorly has extended in fig. 4 almost as far as the opening of the duct. While the separation goes on at first anteriorly, in less than two days a posterior separation also takes place. The result of the whole is that the liver is now of a reniform shape, with the hilum situated slightly posterior.

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* *Ninth Annual Report of the Fishery Board for Scotland*, Part iii., pp. 311, *et seq.*

† I have to thank Mr F. G. Binnie for the faithful drawings of my sections on the accompanying plates.

‡ 'Recherches d'Embryologie comparée sur de développement du Brochet, &c.,' *Mem. Sav. Etrang. Acad. des Sc.*, tom. xvii.

§ *Embryologie des Salmones*, in *Histoire Naturelle des Poissons d'Eau douce de l'Europe centrale*, par L. Agassiz. Neuchatel, 1842.

When it has attained to this shape there is a further development in the character of the digestive tube. The upper wall of the gut has undergone thickening, and projects into the lumen of the tube opposite the opening of the ductus choledochus; possibly this abutment represents the beginning of the formation of the pyloric valve. The liver grows in a dorsal direction on either side till it completely envelopes the intestine (fig. 5, *lr.*), and it is only in the region where the duct is given off from the tube that the cells of liver and intestine are indistinguishable. The liver, which up to this time was uni-lobular, has now assumed a two-lobed form, a left ventral, and a right dorsal lobe. The intestine in cross section is tri-radiate at the point of opening of the ductus choledochus, the lower ray being formed by the lumen of the duct. Still the liver is an accumulation of cells comparable to Vogt's '*essaim d'abeilles*,' but soon it assumes a lobulated form, and the right and left lobes are themselves being divided into lobules (figs. 6, 7, 14, 15, 22, and 23).

The compact nature of the liver does not continue. Spaces about this time are seen in the substance of the liver, and represent hepatic ducts. The large cavity situated between the right and left lobes (fig. 6, *g.b.*), is the gall-bladder. Lereboullet's contention that the gall-bladder has an origin independent of the liver is only in a limited sense true. Speaking of the pike, he says:—'*La vésicule biliaire paraît, d'àpres cela, avoir une origine indépendante du foie et se produire par exsertion de l'intestin.*' My sections show that the gall-bladder is not produced in the interior of the liver, as, *e.g.*, the auditory sac is produced by an independent separation of radially-arranged cells, but that it is formed by a widening of the principal duct. Nevertheless, the cells of the wall of the bladder are principally cells of the liver, which are used in the formation of the bladder-wall. The ductus choledochus shifts its position gradually to the left side, as illustrated in figs. 4, 15, 5, 6, 7; and after it has turned through an angle of about 90 degrees, the walls, which are of distinctly columnar cells, diverge from one another, forming the lumen of the gall-bladder. In fig. 6 the part of the ductus choledochus, which becomes the cystic duct, has a single-celled layer of regular columnar cells, while the walls of the bladder proper are composed of cells which have not yet assumed the columnar form, though they exhibit nuclei with nucleoli at irregular distances. So the '*vésicule biliaire*' may be considered as '*se produire par exsertion de l'intestin.*' While the duct as a diverticulum of the intestine has been lengthening, papillæ have been developing from the walls of the intestine into its lumen, and the intestine itself is being coated with muscular fibres. Not only the gall-bladder but the ducts may be regarded, as Lereboullet describes the former, '*un appendice intestinal.*'

I have seen nothing corresponding to the description and fig. (No. 141) which Vogt gives. In all my sections there is only a single diverticulum from the intestine entering the liver, thus differing from Balfour's * description and fig. 421 of the development of the liver in *Scyllium*, where, though the diverticulum may be at first single, it may afterwards grow out into two lobes, and also from Götte's figures of *Bombinator* and the Chick, as given in *Balfour's Embryology*, figs. 420 and 422. In *Bombinator* the figure makes the liver a pouch, but in the plaice the pouching is only secondary to the pronounced thickening of the ventral wall of the intestine. In fig. 15 the cells of the diverticulum, which in fig. 5 gradually melted into the cells of the liver, have now become quite distinct from the latter, and the diverticulum ends cæcally. The wall at the cæcal end appears greatly thickened, but this is accounted for by the section being slightly oblique at this point. Figs. 22 and 23 show the duct in transverse section in an embryo a few hours older, and fig. 14 shows very distinctly the opening of the ductus choledochus into the intestine, and also a transverse section through the thick wall of the duct (*g.b.*) more vertically. No single section shows the entire duct from the intestine to the gall-bladder, but it is easily traced in a series of sections, throughout its whole length. Figs. 6 and 7 show the duct, in the first, proceeding from the gall-bladder, and, in the second, arising from the left side of the intestine, and curving round it for half its circumference, so that, though the sections are taken from two embryos of nearly equal ages, they represent practically the whole course of the duct. Five days after the first indication of the liver, the organ shows two lobes, and in figs. 22 and 23, drawn from sections of embryos of this age, the formation of hepatic lobules takes place in the liver, which has just become bi-lobed.

The results put shortly are these :—The liver is formed by the proliferation of cells from the ventral wall of the gut; the ductus choledochus is a diverticulum from the intestinal tube, it is always single, and a dilatation of this tube forms the gall-bladder.

While the agreement between embryologists, who have treated of the Teleostean liver, is nearly absolute, a difference of view is encountered when we come to consider the origin of the heart and the structure from which, especially, the endocardium has been formed.

The heart arises underneath the still solid œsophagus, and in close proximity to it. It is situated in the region below the mid and hind brain, and occupies a position in the angle between the anterior border of the yelk-sac and the head of the embryo. The heart, as a tubular structure, is primarily the endocardium alone, the development of myocardium being later, as will be seen from a consideration of sections of about the eighth day. The accounts given by different authors, who have treated of the development of the vascular system, show a diversity of opinion. It is quite impossible to trace the origin of the heart, either in the living embryo, or in preparations of unsectioned embryos. The authors who have described the origin of the heart from such specimens deal not with the first appearance of the structures that form the heart, but only with stages later than the very earliest. So Lereboullet's * description of the heart in the trout, pike, and perch, as '*un corps cylindrique ou conique, solide, plein, composé de cellules couché sous la tête*,' refers to a stage somewhat subsequent to the first appearance of the heart. Kupffer's † fig. 9 of *Gasterosteus* and description of the sac, as '*Ein strumpf konischer Körper*,' applies only to the already well-formed heart. Wenckebach's ‡ careful investigation into the origin of the heart in Belone, is based almost entirely on observations made on the living embryo, and his definite mesoblastic band derives more support from external views than from anything I can find in my sections. Though I have not seen anything in the plaice to support the view which he gives in fig. 7, yet I must agree with him and with Ziegler,§ that the cells which go to form the heart are derived from the indifferent mesoblast of the head.

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* *Comparative Embryology*, vol. ii., London, 1881.

In the embryo, about the beginning of the eighth day, sections across the region of the hind brain show the heart as a quadrangular cavity (fig. 8, *en.*), bounded above by the lower layer of the fore-gut, below by the yelk, and laterally by the splanchnic layers of the mesoblast approaching from either side. The section of the tube is composed of a very thin layer of tissue with nuclei here and there, and this tissue penetrates from each of the four corners, above, between the ventral walls of the œsophagus and the upper limbs of the splanchnic layers already mentioned, and below, between the ventral limbs of the splanchnopleure and the ventral yelk. This cavity is the true cavity of the heart, and the tissue of its walls ultimately becomes the endocardial lining of the myocardium. As to the origin of the endocardium, it is to be noted that it is seen to be continuous between the ventral layer of splanchnopleure and the ventral wall of the body, with the mass of mesoblast figured on the right side. This mesoblast stretches from the branchial invagination (*br.c.*) to the fore-gut (*f.g.*), and to the two layers of mesoblast approaching the median ventral line; and it can be traced to isolated cells lying underneath the ventral layer of splanchnopleure—marked in the figure *w.c.*—which are in close relation with the ventral prolongation of the endocardial tube. The cells marked *w.c.* apparently represent the cells marked *hz.* ('*wanderzellen*') by Ziegler in figs. 30 *et seq.*, and, with Ziegler, I believe that they do not arise from nuclei of the yelk. Hoffman's ‖ view that the endothelium is '*Ein product des entoderms*,' and that the cells of the endothelium arise '*Durch Proliferation des hier gelegenen Zellen des Entoderms des Parablastes*,' is not supported by anything I have seen in sections of the plaice, but the reverse is the case. Hoffman's figures (taf. ii. fig. 9, taf. iii. fig. 4, and taf. iv. fig. 6), are too diagrammatic and symmetrical for much reliance to be placed on them.

This endocardial cavity soon becomes surrounded by the union of the dorsal splanchnic plates (*Seitenplatten* of Ziegler, and *Pericardialplatten* of Oellacher) above, and by the confluence of the ventral splanchnopleure layers. In embryos of half a day older than fig. 8, the endocardial tube has been enclosed by the splanchnic layers (fig. 9), and there is now a myocardium as well as endocardium. The endocardium is only one cell-layer in thickness, while the myocardium is one or more layers thick. The myocardial walls push the endocardium inwards, from above downwards till the dorsal and ventral layers are almost in apposition (fig. 9 *en.*). In embryos a day older (fig. 11, *en.*), the two layers of endocardium are in close contact, as seen in median longitudinal section. In this section the endocardium is apparently not connected with the myocardium, but in neighbouring sections of the same embryo the endocardium is connected with the myocardium, as in fig. 9. Till nearly twelve hours afterwards the endocardium is only one cell-layer thick, but in fig. 12 an increase is seen at the ventricular end of the heart, but this apparent thickening may be due to the division between the dorsal and ventral layers not being clearly discernible on the left side of the figure. This is more likely to be the case, as older embryos of the eleventh day (fig. 13) exhibit the endocardium as only a single layer in thickness at the ventricular end of the heart. It is interesting to notice the relation of the myocardium and endocardium from the end of the eighth till the end of the eleventh day. At first the endocardial tissue is made to approximate dorsally and ventrally, till it appears to lie as a solid mass in the myocardial tube, and then its dorsal and ventral layers separate, and they form an endocardial tube within a myocardial envelope. This latter separation or change takes place simultaneously, with the indication of the division of the heart into two chambers (figs. 12 and 13, *v.* and *a*). The heart at first does not project ventrally, but lies in the angle (fig. 10) between the medulla and the ventral portion of the mid-brain; as the development of the embryo however advances, the protuberance becomes very distinct. This seems to be the stage at which Kupffer first noticed the heart in *Gasterosteus*, and it is the first stage generally figured by those who have contented themselves with observations on the living embryos.

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* 'Recherches d'Embryologie comparée sur le développement de la Truite,' &c.—*Ann. de Sc. Nat.*, tom. xix.

† 'Beobachtungen über die Entwicklung der Knockenfische,' *Archiv. f. Mikros. Anat.*, Bd. iv.

‡ 'Zur Entwicklungsgeschichte der Knockenfische,' *Archiv. f. Mikros. Anat.*, Bd. xxviii.

§ 'Die Entstehung des Blutes bei Knockenfischembryonen,' *Archiv. f. Mikros. Anat.*, Bd. xxx.

‖ 'Zur Ontogenie der Knockenfische,' *Natuurk Verh. der Koninkl. Akad. van Wetens. te Amsterdam*, 1882.

The pericardium is first seen as double, being in fact the lumen between the dorsal and ventral layers of the mesoblast bounding the endocardium laterally. I have been unable to trace the pericardium at so early a stage as Zeigler shows in fig. 30, of an embryo salmon of thirteen days, but I can corroborate his observations on embryos a little more advanced in regard to the pericardial cavities, or what becomes the pericardium. From embryos of the eighth day onwards, it is possible to trace in serial section the ultimate destination of the two cavities enclosed within the splanchnic layers of either side, and the pericardium is figured as double in fig. 8, *pc*, and single in figs. 9 and 11. The walls of the pericardium from the first are quite distinct, and the heart occupies the larger portion of its space.

The heart is suspended in this chamber, and on the ninth and tenth days seems to be connected anteriorly with the walls of the pericardium. Ventrally, the space between the heart and the pericardial wall is lessened, and the heart is seen to press on the latter.

The heart is continued into the sinus venosus (fig. 13, *sv.*) posteriorly. This vessel is first noticed about the time when the first indication of the division of the heart by a slight transverse constriction into auricle and ventricle is shown. In fig. 12, at the right hand (auricular) end of the heart is seen a proliferation, which may represent the incipient sinus venosus; certainly, a few hours afterwards, the connection of auricle and sinus venosus is complete. Simultaneously the myocardium changes, the posterior portion remains single-layered, while the anterior and ventricular portion increases by a proliferation of cells from its wall. The single layer of the posterior portion is continuous with the very much thinner walls of the sinus venosus.

Paul Mayer,* following Rabl,† says, '*Ist die aussere Wand des* '*Herzens nur ein Accessorium und das Endocardium das eigentliche* '*Herzrohr.*' From what has been said above, it follows that the Teleosteans agree with the Selachians and Amphibians, of which those authors respectively treat, in the endocardium being the heart proper, and the myocardium being an accessory portion. In my sections of embryos of different ages the endocardial lining is always present within the myocardium, so that no support is afforded the view that it is a product of the myocardium.‡

Oellacher was the first to point out the origin of the heart ('Herzanlage') from the lateral mesodermic plates of the head, but his conclusions as to the origin of the endothelium from the mesoblast are not so completely demonstrated as is the similar result at which Ziegler has arrived in sections of younger embryos. Zeigler § sums up his statements on this subject thus:—'*Das letztere* (*Endothel*) *mitsammt einer Anzahl von* '*Wanderzellen entstammt einer Gruppe von Mesodermzellen; diese Zellen* '*sind in continuirlicher Forsetzung des Mesoderms des Kopfes.*' Henneguy ‖ concludes, '*Le résultat de mes observations est absolument semblable* '*a celui de ces deux auteurs,*' viz., Oellacher and Zeigler, but his figures, Nos. 104 and 114, as well as his description, shows the heart of the trout to have a double origin. According to him, an endothelial tube is produced on each side under the splanchnopleure layers, and these two tubes ultimately fuse together. In the plaice only one, not two tubes, are formed. With this difference, my results are in harmony with those of Henneguy. Hoffman's ¶ '*Entoderm des Parablastes,*' from which he derives the endothelium of the heart, is, I believe with Ziegler, only 'part of the endothelium of the heart found under the splanchnopleure.' To derive this from parablast is only a begging of the question, for the origin of the cells, which he figures and calls entoderm-parablast, so far as I can make out, has not been determined by him.

The heart, therefore, is primarily an endothelial tube derived from the lateral plate of mesoblast of the head, and the myocardium is formed by the splanchnopleure which bounds the endocardial tube laterally. The pericardium is two lateral cavities within the dorsal and ventral layers of splanchnopleure of either side, and on the meeting together of the dorsal layers of opposite sides and the union of the ventral layers, the cavities fuse, and the pericardium becomes impaired.

The renal organs appear shortly after the endothelial tube of the heart is formed, and about a day before the ventral wall of the mesenteron shows the thickening which gives rise to the liver. In the plaice, towards the close of the eighth day, the solid condition of the renal organ is traceable through several sections, about the middle of the embryo. Figures 18, 19, and 20 indicate the origin of the organ from the intermediate cell-mass. The pronephric duct seems to arise as a fold directed laterally and dorsally. In the most anterior section (fig. 20), the intermediate cell-mass of mesoblast seems to become nearly divided into two portions towards the middle. The lower portion (fig. 20, *prn.*), between the gut and the larger part of the somatoblast, is continuous externally with the ventral surface of the latter, and is composed of cells having large nuclei; it abuts on the gut on the inner and upper face, and is separated from it ventrally by the small portion of the cœlom.

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* 'Ueber die Entwicklung des Herzens, &c., bei den Selachien,' *Mitth. Zool. St.*, Naples, Bd. vii. Hft. ii.

† 'Ueber die Bildung des Herzens der Amphibien,' *Morp. Jahrb.*, Bd. xii.

‡ M'Intosh and Prince derive the endocardium from the walls of the myocardium. *Trans. Royal Society*, Edin., 1890.

§ *Loc. cit.*, p. 622.

‖ 'Recherches sur le développement des poissons osseux,' *Journal de l'Anatomie*, vol. xxiv. N.S.

¶ *Loc. cit.*

From this aggregation of cells the pronephros is developed as a fold (fig. 19, *prn.*), extending outwards and upwards between the remainder of the intermediate cell-mass and the tissue separating it from the yelk beneath. The fold is solid, and is formed of a double row of cells very like a solid pouch. More posteriorly (fig. 18, *prn.*), the fold has a lumen at its ventral and inner end, and the pronephric tubule communicates freely with the body cavity. While the pronephric funnel is shown on the right hand side of the drawing, the solid well-defined rod is seen on the left. The fold, which in fig. 19 was a longitudinal aggregation of cells, becomes in fig. 18 an oval mass of radially arranged cells. The organ is first formed in the mid-region of the trunk, and so gradually extends forward. Whether the pronephric funnel, shown in fig. 18 communicating with the body cavity, is the same as those shown in figs. 27 and 28, opening into the cavities lodging the glomerulus, I am unable positively to affirm. From a study of sections of older embryos, I am inclined to the belief that the opening persists. At any rate, in the embryo of fig. 18, though there is a solid fold extending through several sections, there is only a single nephrostome confined to two sections.

The pronephric fold grows rapidly forwards and also extends backwards. Posteriorly, in embryos of the ninth day, it is developed from the same intermediate cell-mass, but more from its ventral and outer margin. Fig. 21 shows it as a solid blastema on the left, and on the right of the figure the radially arranged cells of the rod have separated and formed the lumen of the duct (*s.d.*). Fig. 17 is a section of an embryo, thirteen hours older than that of fig. 21, and shows the organ *prn.* as a well-marked ventral rod of the intermediate cell-mass.

Till about the tenth day the ducts are on the same level as the upper half of the gut-wall, but as the embryo advances they become more dorsal (figs. 5, 6, 22, 23 *s.d.*), and at birth (fig. 7) they migrate nearer the middle line, nearly underneath the notochord.

The cells bounding the lumina of the ducts are in a single layer, and regularly cylindrical. The ducts run parallel with each other till they unite near the anal portion of the gut, and open by a single median duct into the widely dilated portion or urinary vesicle (figs. 24 and 25, *u.v.*). The urinary dilatation, which is formed very early, opens, as M'Intosh and Prince* demonstrated in *Molva vulgaris* (*Cf.* Plate XX. fig. 13), into the rectum. List† describes a similar connection of rectum and urinary bladder in *Crenilabrus pavo.* This communication of urinary bladder and rectum is shown in fig. 26, which is a drawing from an embryo of the fourteenth day. The cylindrical character of the cells of the tube is maintained till they end in the widely dilated urinary vesicle, but the walls of the vesicle itself are formed of flattened epithelium, the cylindrical cells of the ducts merging gradually into the flat cells of the thin wall of the vesicle. After the birth of the embryo the posterior extremities of the ducts are continued still further backwards, so that they form an elbow-shaped bend before joining the urinary bladder. The urinary vesicle after the extrusion of the embryo from the enveloping membrane has no longer any connection with the hind-gut; it is prolonged ventrally alongside of the papillary elevation of the rectum, but posterior to it, and ends blindly at the same level as the still closed anal termination of the intestine. Two stages in the downward development of the urinary bladder are shown in figs. 24 and 25. In both cases the vesicle is irregular in outline, but this may in part be due, though not wholly, to the unequal shrinkage brought about by the action of the reagents used in manipulation.

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* *Loc. cit.*

† 'Ueber die Beziehung der Harnblase zu den Enddarme bei Teleostierembryonen (Labriden), *Anat. Anzeiger*, iv. Jahrg. No. 16.

The ducts, which at first were more or less ventral, seem to lie on the same level as the ventral part of the notochord, but a little distance from it. As the ducts are developed anteriorly, they do not approach each other, but possibly the distance between them is increased. The ducts become coiled at their anterior ends, so that transverse sections show not a pair, but as many as three pairs of ducts in the same plane (figs. 27 and 28, *prn.* The duct at its anterior extremity is bent on itself, and the inner limb is continued posteriorly till it opens into the capsule lodging the glomerulus. This opening is seen on the left side in the sections (figs. 27 and 28). The pronephric tubule on the eighth day, as noticed, communicates with the body cavity, but when the glomerulus is developed in embryos of about twenty days, the tubule is no longer in communication with the cœlom, but opens into the closed glomerular cavity. The glomerulus is formed immediately below the aorta, and doubtless arises from the loose trabecular tissue under the notochord from which the aorta is formed. In some sections the glomerulus appears as a single median structure, but four or five days after hatching the structure is paired. Even in older forms the division of the two glomeruli is still incomplete. In fig. 28, *gl.*, which represents a section of an embryo nine days hatched, the division is not so manifest as in fig. 27, *gl.*, which is younger by four days than that of fig. 28. The glomerulus exhibits a vascular structure, and the tissue between the pair forms the mesenteric connection of the intestinal tube. They are situated in the same region as the gall bladder, and the pronephric tubule is continued forward to about the anterior end of the liver.

The segmental duct is undoubtedly derived from mesoblast in the plaice. Epiblastic invaginations are present in figs. 19 and 20, *l.s.o.*, which might be mistaken for renal thickenings, but their position and their limited extent mark them out as lateral sense organs. These apparently correspond to 'the thickening of that portion of the surface epiblast, overlying the intermediate cell-mass,' which Brook * described in the trout as renal. Whatever may be the case in the development of the segmental duct in Mammals, Amphibians and Elasmobranchs, my results coincide with these of Rosenberg,† Oellacher,‡ and Hoffman § on the teleostean kidney, as to the origin of the segmental duct.

As to the opening of the tubule, there is a single opening for either side in the early stages to the body cavity, and later to the glomerular cavity, but there is no trace of multiple openings, as in Amphibians and Selachians, and in the segmental organs of Annelids.

The Pleuronectidæ of our seas lack a swim-bladder. Having regard to the fact that the Physoclistous Teleosteans, while they have a ductus pneumaticus during larval life like the Physostomi, lose this as development advances, and that no trace of a swim-bladder had been obtained in the Pleuronectidæ, I examined the young stages particularly of the plaice, in order to ascertain if any rudiment of the swim-bladder was present. In an embryo of the eighth day, that is at the same time as the appearance of the heart, I found that a small furrow was formed along the dorsal wall of the digestive tube, and that it was continued through a dozen sections. Figs. 16 and 17 show this furrow in the middle and at one end. This furrow soon disappears, and it is the only dorsal diverticulum which can correspond with the swim-bladder diverticulum of other Teleosteans. It appears one day and a half before the first indication of the thickening of the ventral wall of the gut, which gives rise to the liver. The diverticulum which Miklucho-Maclay* observed in Selachians, arose from the dorsal side of the gullet, while Van Baer, who first described the origin of the swim-bladder, found that the outgrowth was placed slightly in front of the liver. In the plaice the furrow observed is developed behind the fore-gut, though this is not yet distinctly marked off from the mesenteron. It arises before there is any trace of the formation of folds in the intestine, and disappears within two days, before, in fact, the internal surface of the gut is increased by the ingrowth of papillary prominences from the thickened walls. The suggestion that this diverticulum may mark, what in other Teleosteans is the swim-bladder, is put forward tentatively, and, the more posterior origin notwithstanding, it may be the equivalent of the diverticulum that Miklucho-Maclay found in the Selachians.

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* 'Note on the Epiblastic Origin of the Segmental Duct in Teleostean Fishes and in Birds,' *Proc. Royal Society, Edin.*, 1887.

† 'Untersuchungen über die Entwick. der Teleosteierniere.' *Inaug. Dissert*, Dorpat 1867.

‡ *Loc. cit.*

§ *Loc. cit.*

EXPLANATION OF THE DRAWINGS ON PLATES XIII.-XVI.

a,	auricle.
ao,	aorta.
br.c,	branchial cleft.
b.v,	blood-vessel.
d.c,	ductus choledochus.
d.f,	dorsal fin.
en,	endothelium or endocardium.
ep,	epidermis.
f.b,	fore-brain.
f.g,	fore-gut.
g,	gut.
g.b,	gall-bladder.
gl,	glomerulus.
h,	heart (myocardium).
h.b,	hind-brain.
h.g,	hind-gut.
hy,	hypoblast.
lr,	liver.
l.s.o,	lateral sense organ.
m.b,	mid-brain.
m.o,	medulla oblongata.
my,	myotome.
nc,	notochord.
ne,	neurochord.
p.c,	pericardial chamber.
p.f,	pectoral fin.
prn,	pronephros.
s.d,	segmental duct.
s.v,	sinus venosus.
sw.bl,	swim-bladder.
u.v,	urinary vesicle.
v,	ventricle.
w.c,	wandering cells of mesoblast.

PLATE XIII.

Fig. 1. Transverse section of an embryo 8 days 19½ hours old in the region of the liver, × 250.

Fig. 2. Median longitudinal vertical section of an embryo 10 days 7½ hours old through the mesenteron and liver, × 150.

Fig. 3. Longitudinal vertical section to one side of the middle line of the same embryo in the same region, × 150.

Fig. 4. Oblique longitudinal vertical section of an embryo 12 days 19½ hours old through the liver and its duct, × 150.

Fig. 5. Transverse section of an embryo of the same age in the region of the pectoral fin, × 150.

Fig. 6. Transverse section of an embryo of 19 days—2 days hatched—in region of gall-bladder, × 200.

Fig. 7. Transverse section of an embryo of 18 days—1 day hatched—where duct of liver enters the intestine, × 200.

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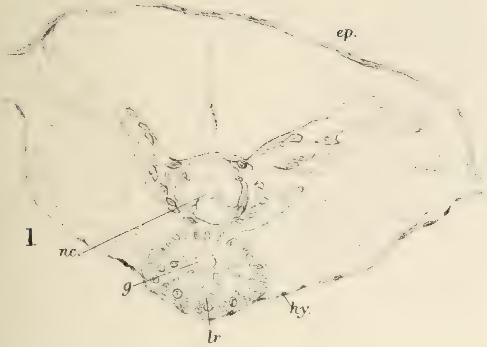
* *Cf.* Balfour. *Loc. cit.*, p. 628.



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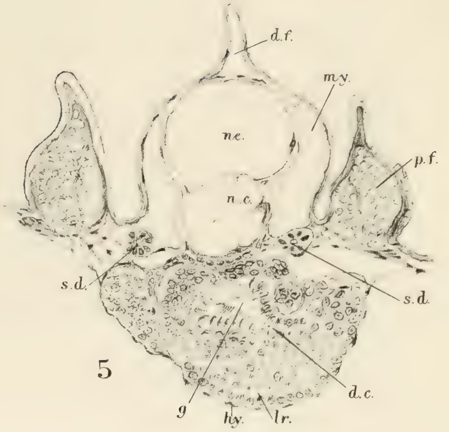

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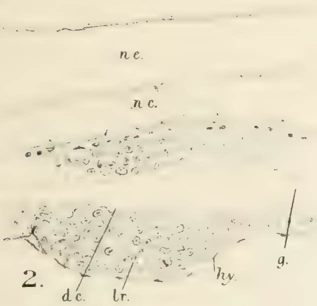

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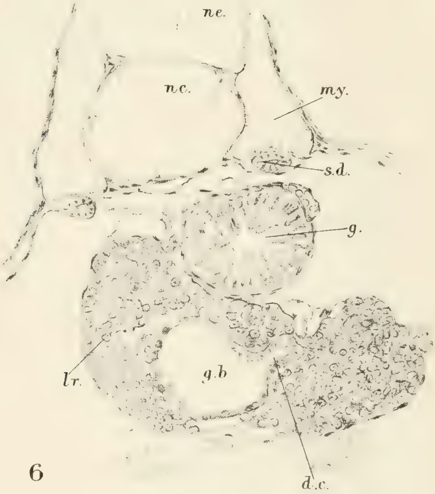

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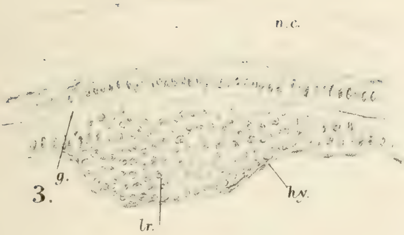

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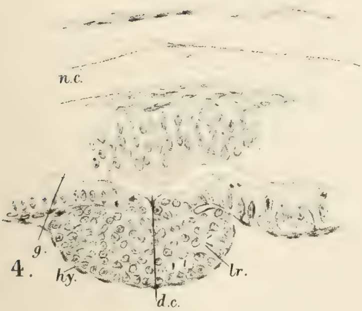

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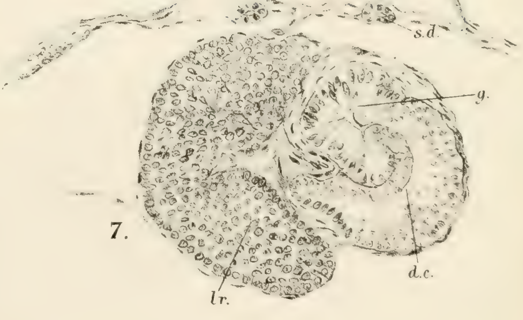

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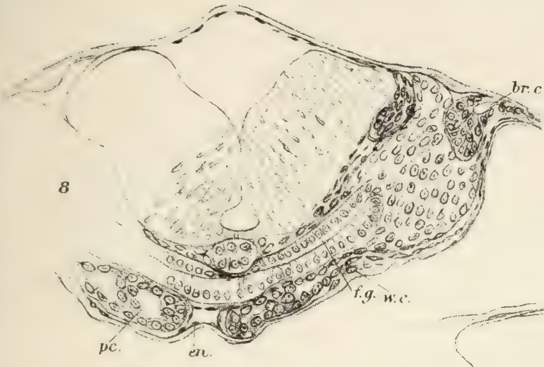

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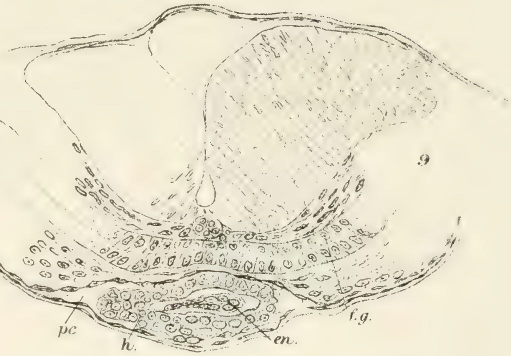

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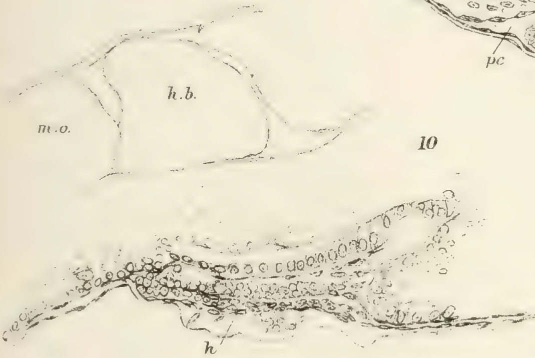

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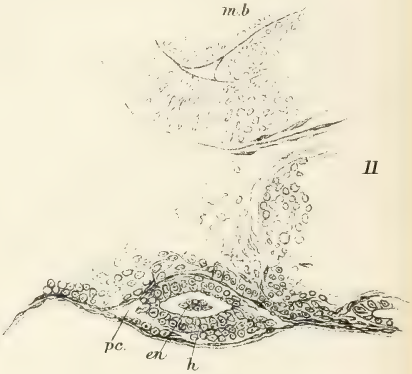

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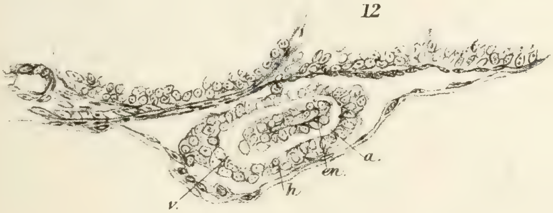

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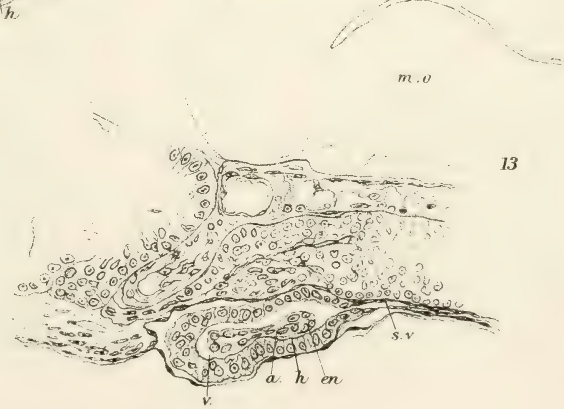

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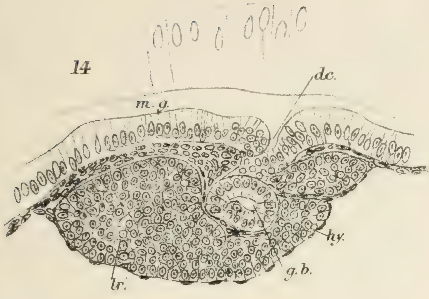

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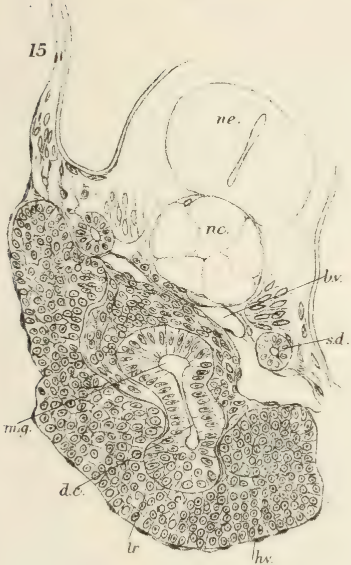

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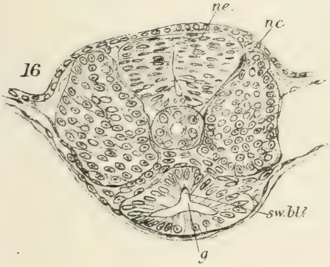

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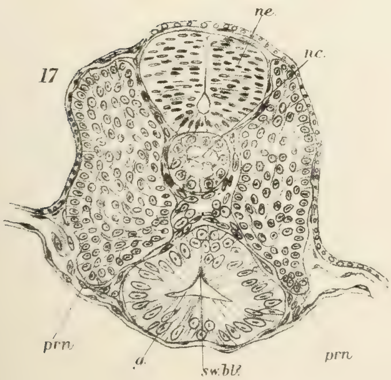

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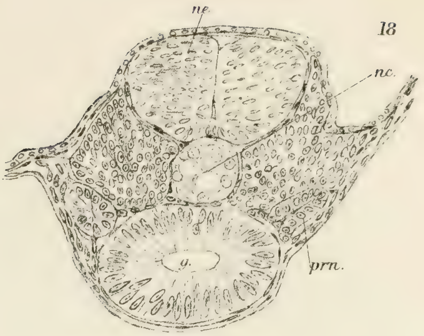

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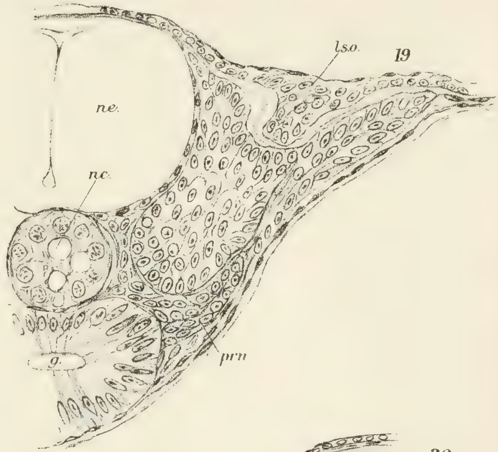

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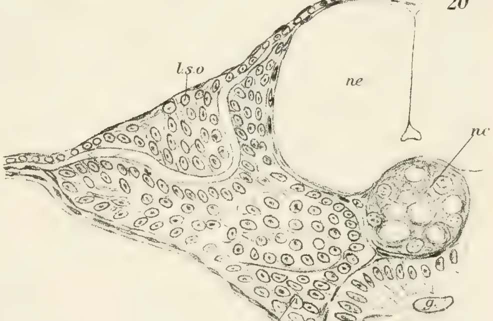

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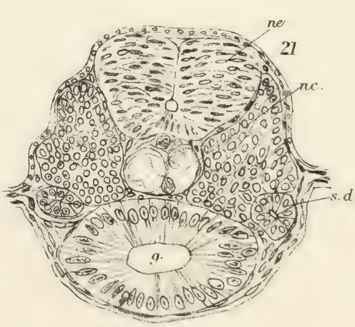

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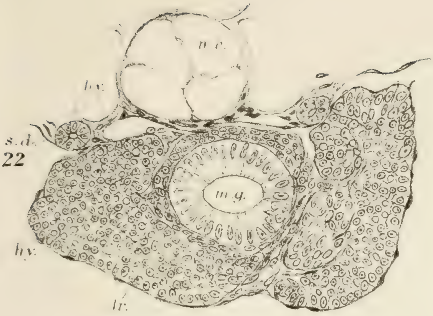

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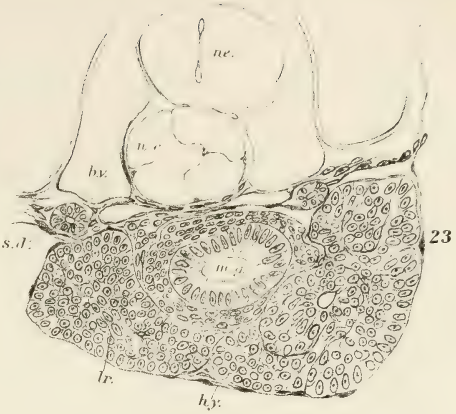

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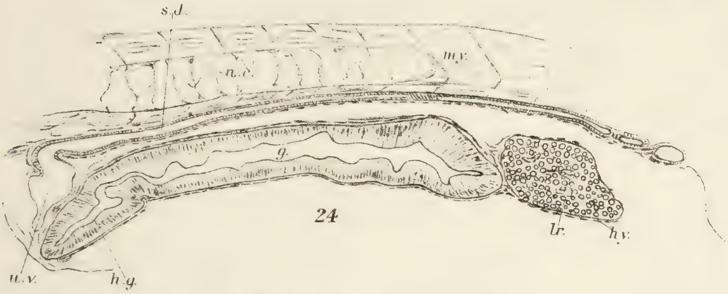

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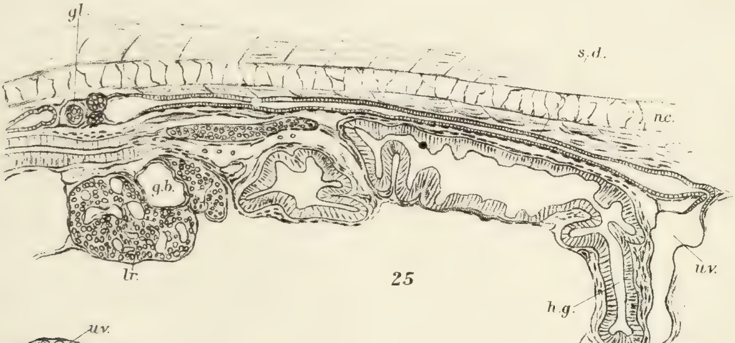

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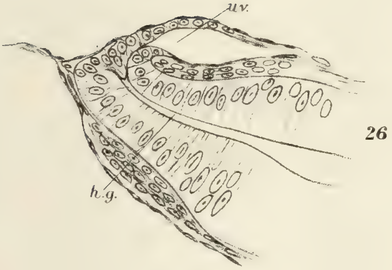

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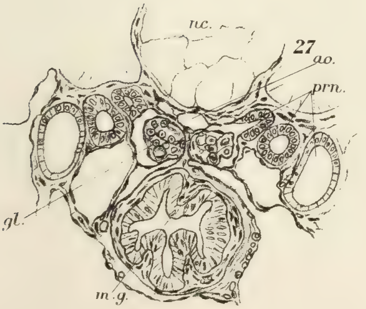

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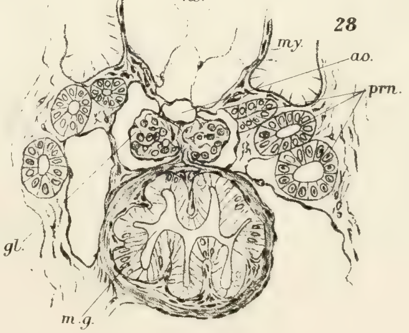

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PLATE XIV.

Fig. 8. Transverse section of an embryo 7 days 6½ hours old in region of hind-brain, × 250.
Fig. 9. Transverse section of an embryo 7 days 19½ hours old in the same region as the preceding, × 250.
Fig. 10. Longitudinal vertical section (nearly median, but slightly oblique) of an embryo 8 days 6½ hours old in region of mid- and hind-brain, × 250.
Fig. 11. Longitudinal vertical section (oblique) of an embryo 8 days 19½ hours old in region of mid-brain, × 250.
Fig. 12. Longitudinal vertical section (median) of an embryo 10 days 7½ hours old through the heart, × 250.
Fig. 13. Longitudinal vertical section (nearly median) of an embryo 10 days 19½ hours old in region of hind-brain, × 250.

PLATE XV.

Fig. 14. Longitudinal vertical section (nearly median) of an embryo 14 days 20½ hours old through mesenteron and liver, × 200.
Fig. 15. Transverse section (combined from two sections) of an embryo 13 days 7½ hours at the point where the ductus choledochus opens into gut, × 200.
Fig. 16. Transverse section of an embryo 7 days 16½ hours showing a dorsal diverticulum of the gut, × 250.
Fig. 17. Transverse section of an embryo 8 days 19½ hours old showing a similar diverticulum, × 250.
Fig. 18. Transverse section (sagittal) of an embryo 7 days 19½ hours old in the region of pronephros, × 250.
Fig. 19. Transverse section of an embryo of the same age as the preceding in the region pronephros, × 350.
Fig. 20. Transverse section of the same embryo as Fig. 19, but three sections more anteriorly, × 350.
Fig. 21. Transverse section of an embryo 8 days 16½ hours old through anterior end of segmental duct, × 250.

PLATE XVI.

Fig. 22. Transverse section of an embryo 13 days 20½ hours old in the region of the pectoral fin, × 200.
Fig. 23. Transverse section of the same embryo as the preceding, but more posterior, × 200.
Fig. 24. Longitudinal vertical section (slightly oblique and combined from two sections) of an embryo 19 days—2 days hatched—through the gut and renal organ, × 80.
Fig. 25. Longitudinal vertical section of an embryo 22 days—5 days hatched—through the same region as the preceding, × 80.
Fig. 26. Longitudinal vertical oblique section of an embryo 13 days 20½ hours old, showing the passage from the urinary vesicle to the rectum, × 250.
Fig. 27. Transverse section of an embryo 22 days—5 days hatched—through the pronephros and glomerulus, × 200.
Fig. 28. Transverse section of an embryo 26 days—9 days hatched—through the same region as the preceding, × 200.

VIII.—THE PELAGIC FAUNA OF THE BAY OF ST ANDREWS.

By Prof. M'Intosh, M.D., LL.D., F.R.S.

The pelagic fauna of the bay, while presenting certain common features in the monthly returns from year to year, yet often shows considerable variations. Thus, for instance, the beautiful and conspicuous pteropod *Clione*, which appeared in April 1887, was not again met with till the spring of this year (1893). The abundant ctenophore, *Pleurobrachia*, which had been one of the most constant and most plentiful of the pelagic medusæ, completely vanished for the first nine months of 1891—to the disappointment of Mr Riches who, on the faith of its well-known frequency in our nets, had specially come from Plymouth to study its development and life-history. No sooner had he returned southward than it again appeared, and has been constantly met with since. It would be difficult to explain the cause of so sudden and so complete a disappearance. During no season have the myriads of larval and post-larval herrings so filled the bay as in the spring of 1889, when it became necessary to cease to use the bottom trawl-like tow-net, which captured them in immense multitudes. These larval herrings had probably been carried into the bay by currents from the mouth of the Forth, since, so far as known, no deposition of ova takes place in the bay itself. It is, indeed, many years since the eggs of the herring have been noticed at the Old Hake, off the east of Fife (near the Carr Lightship), where Lord Playfair and Prof. Allman carefully investigated them. At any rate, whether eggs are deposited within or near the bay, there is no lack of larval herrings under ordinary circumstances, and the same may be said of sprats.

The young of certain fishes not usually encountered in the pelagic fauna occur at certain definite seasons. Thus the young great pipe-fishes are common in the bottom-nets off the estuary of the Eden. On the other hand, the young eels bury themselves in the sand. The larval fish E (Seventh Annual Report, III., pp. 263 and 309, Plate III. figs. 5, 6, and 7) has again been encountered off Tents Moor, but no further light has been thrown on its relationship, though in some respects it approaches *Cottus*.

If the weather in the first part of May be warm, the young Pleuronectids (such as plaice, dabs, and flounders) of the season often disport themselves at the surface of the water, and can be caught with a hand-net in considerable numbers. This feature was formerly noticed chiefly in the turbot and brill later in the season, *e.g.*, in July and August. On the other hand, the scanty numbers of post-larval gadoids afforded a contrast to the waters of Smith Bank in the Moray Firth, where the post-larval gadoids, ranging from 4 to 16 mm., disport themselves, at the end of April and beginning of May, in multitudes, chiefly near the bottom, though also at the surface.

It is generally supposed that the transparent eggs of the food-fishes, which form one of the most important elements of the pelagic fauna, escape many dangers from their invisibility. It has to be remembered, however, that the embryos in these eggs are sometimes conspicuously coloured with black and yellow—just as the supposed inconspicuous medusæ are with blue, orange, brown, red, and black, though of course the full development of the pigment in the fish only occurs a short time before hatching. Some embryos remain almost devoid of pigment before extrusion—as the sprat, and an unknown form sent to Mr Holt from the west coast of Ireland. An important fact in this connection has also been observed, viz., that in the stomach of a single herring taken from the midst of thousands caught off Shetland, and which was distended with the usual crustacean food, no less than thirty entire pelagic eggs of various species of fishes were found. It is true that these had in all probability been swallowed as the fish gulped the swarms of swimming crustaceans, yet the loss from this cause alone must be serious. It is rare, however, to find pelagic ova in the stomachs of marine animals, yet on one occasion ducks and other birds were feeding on these and perhaps the larval fishes in the Moray Firth; and Captain Dannevig has observed sprats snapping at the pelagic eggs as they escaped from a breeding pond at Arendal. At no period, indeed, during the life-history of the food-fish is it free from attack.

The enormous quantity of pelagic fish-food poured by the neighbouring mussel-beds into the inshore waters has often been referred to in communications from the St Andrews Marine Laboratory. It is one of the most constant factors in the annual supply—first, as minute ciliated spheres, then almost as minute swimming mussels in June, which crowd the waters both at the surface and the bottom, and afterwards settle down like grains of millet-seed on zoophytes, sea-weeds, stones, shells, and indeed on every available site, such as the ropes, buoys, and other parts of the salmon stake-nets.* But while the foregoing mollusks are perhaps the most conspicuous forms in their season, they are not by any means the only ones, for both bivalve and univalve shell-fishes in their early stages are common in the nets throughout the greater part of the year, some of them, *e.g.*, the peculiar flattened spiral shell of the young *Lamellaria*, being so unlike the adult (a more or less sedentary form amongst the rocks) as to have misled zoologists as to its actual position, which was, however, clearly defined, amongst others, by Prof. A. Giard of Paris,† a distinguished naturalist, who has largely extended our knowledge of marine animals. The foregoing forms, with occasional additions of *Spirialis* and *Clione*, take the place of the abundant and varied Pteropods, the curious *Glaucus*, and the brightly-coloured *Ianthina* of the warmer seas.

The remarks made some years ago concerning the distribution of the Appendicularians have been borne out by further experience, the immense multitudes of *Oikopleura cophocerca*, Gegenbaur, and their houses, being characteristic of April and May. The specimens are remarkably fine—according to Prof. Herdman, quite as large as those procured during the voyage of the 'Challenger.' The influence of such forms upon marine life of all kinds must be considerable. The profusion of *Actinotrocha*, the larval form of *Phoronis*, is one of the most diagnostic features of August, though early specimens appear in June, and many in July and September.

No group of pelagic marine animals is more generally distributed throughout the water than the Crustaceans, especially the countless swarms of the Copepods, though certain Amphipods and Thysanopods also occur in great numbers, and form rich feeding-grounds for many fishes, the nets in such areas being rapidly filled with a semi-solid mass of their bodies. The vast numbers of the larval sea-acorns, again, in spring is a noteworthy feature in the inshore waters, where rocks, wood—both stationary and floating—and every available surface, is coated by a densely grouped series as they become sessile. Some fishes, *e.g.*, *Gobius*, in the estuary of the Eden, feed largely in May on the *Cypris*-stage of these sea-acorns. No Amphipod, again, appears to be a more conspicuous feature in the pelagic fauna than *Parathemisto*, which characterises the winter months, especially January and February.

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* The salmon fishermen observe that the ropes have been submerged a month (viz., from May till the middle of June) before a deposit of the minute mussels is noticed.

† *Comptes Rendus de l'Acad. des Sc.*, 22 Mars 1875.

Few groups of invertebrates are more generally distributed in their pelagic larval condition than the Annelids, which are seldom absent from the tow-nets, especially the trawl-like bottom-net. They have been elsewhere referred to,* so that on the present occasion it is only necessary to observe that from January to December they are present at one stage or another, and afford a constant source of food for the smaller fishes. Perhaps the most conspicuous family is that of the Spionidæ, in which is the well-known borer in rocks and shells, viz., *Polydora ciliata.* The curious larva of *Polygordius* is not uncommon in July and August, and *Tornaria* and *Mitraria* also occur.

In our waters the characteristic pelagic Alciopidæ of the southern seas are absent, their place being taken by the ubiquitous *Tomopteris*, and in inshore waters by the active sexual forms of *Autolytus*, the majority bearing ova ; and by an occasional *Heteronereis*-form in spring.

The absence of accurate knowledge concerning the development and life-history of the common cross-fish (*Uraster rubens*) has for many years been a conspicuous blank, and it was well known that no adult had ever been seen bearing eggs externally. It thus appeared to differ wholly from the abundant tidal form *Cribrella oculata* and the somewhat rarer *Asterias Mulleri,*† which is not uncommon at St Andrews under stones in rock-pools, both of which carry the eggs and larvæ over the mouth. The recent researches of Mr Field on *Asterias rubens* ‡ clears up the difficulty, for it is found that the larvæ are pelagic, and form in St Andrews Bay part of the teeming multitudes of larval Echinoderms, which in the form of Bipinnarians, Brachiolarians, Auricularians, and Plutei, characterise the warmer months. The vast myriads of the minute eggs of the common cross-fish are given off in May and June.

The irregularity in the appearance of the larger medusæ, *e.g.*, *Aurelia* and *Cyanea*, in multitudes, has again been illustrated during the last season, when comparatively few entered the bay, whereas in 1891 both were common. A knowledge of the effects of currents and other facts connected with their distribution is not yet sufficiently accurate to enable us to make an explanation of the causes of such variations. The hydromedusæ, on the other hand, seems to be more regular, the majority occurring in June, July, and August, while *Tima* and *Aglantha* are characteristic of the winter months. In April the medusoid *Hybocodon* generally makes its appearance, and continues to the end of summer. They are conspicuous by their four carmine ocelli, and their two tentacles have batteries of thread-cells. Large buds spring in some from the neighbourhood of an ocellus near the two tentacles, and the conspicuous faintly-pinkish manubrium (of a trumpet-shape) occasionally encloses a Copepod. Professor Alex. Agassiz § connects it with a tubularian growing singly ; it might also have been supposed to be related to *Corymorpha*, which occurs off the Budda Rock. Another interesting addition to the pelagic fauna is the beautiful garnet-tinted *Halistemma*, several examples of which were procured in the bottom-net, and described by the Rev. A. D. Sloan, B.Sc.||

The larval forms of *Peachia* and allied species occur with great regularity in spring and summer—the earlier stages during the former period, the older during the latter.

Very few Radiolarians have been obtained in the surface-nets. On the other hand, the various species of *Ceratium* are abundant almost through-

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* *Ann. Nat. Hist.*, ser. 6, vol. 6, p. 174.

† I am indebted to Professor Jeffrey Bell for the identification of this form.

‡ *Quart. Jour. Micr. Sci.*, vol. 34, p. 105, Nov. 1892.

§ *N. Amer. Acalephæ*, p. 193, 1865.

|| *Ann. Nat. Hist.*, 1891, 6 ser. vol. 7, p. 413.

out the year, and, as formerly mentioned, are the cause of phosphorescence in the water on certain occasions. This genus (*Ceratium*) has been considered by various authors as algoid, *e.g.*, by Dr John Murray in the Report of the 'Challenger,' and by F. Schütt in the recent Plankton Expedition of the German Government.* On the other hand, Gourret † and Pouchet ‡ maintain more or less their relationship with the cilioflagellate Infusoria.

The abundance of plant-life in the inshore waters of this area is a prominent feature. Diatoms, algæ in multitudes, and resembling those named, *Antelminellia*, *Chœtoceras*, *Pyxilla*, *Bacteriastrum*, and the various forms of *Rhizosolenia*, occur constantly in the nets. The abundance of the latter form occasionally causes a greenish discoloration of the water. §

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* *Reisebeschreibung der Plankton-Expedition*, von Dr Otto Krümmel, &c. Kiel u. Leipzig, p. 266, &c., 1892.

† *Ann. du Musée Hist. Nat. Marseille*, 1883. *Mém. No.* 8.

‡ *Jour. de l'Anat. et Physiol.*, 1883, p. 399.

§ I am indebted for much assistance in the preparation of the following tables to Mr J. Pentland Smith, M.A., B.Sc., now of the Horticultural College, Swanley, Kent, who conducted the examination of the contents of the tow-nets with great ability and punctuality.

[TABLES.

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net)	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size. Coloration, etc.	Hydromedusæ.	Medusæ.
29th November 1887. Pier head	Towards Kinkell Ness 3 fathoms	All Sand	*Pleurobrachia*, many, and ova of *Pleurobrachia*					*Pleurobrachia*, large and small *Lesueuria*, a few adult
13th January 1888. North of Pier	Towards Bell Rock 4 fathoms	All Sand		1 hour		1 young *Syngnathus acus*, 2½ inch		
14th January 1888. Off Pier head	Northwards 4 fathoms	All Sand		1 hour				*Pleurobrachia*, numerous, large and small some larval)
16th January 1888. 2½ miles N. of Pier	To near E. Rocks 4 fathoms	All Sand						*Lesueuria*, a few
19th January 1888. 100 yards from Pier head	By salmon nets to Castle and thence to about 300 yards off Eden, keeping *en route* about ¾ mile from low water mark 3 fathoms							
20th January 1888. (1) Baths, forenoon	To Eden 3 fathoms	All Sand						*Pleurobrachia*, large and small
(2) Swilcan Burn, afternoon	To Baths 6 feet to 1 fathom	All Sand				Sprats, flounders		*Tima bairdii*, Johnst., with reproductive organs almost fully developed, 1½ inches across, colourless, transparent

Mid-water Net.							Diatoms.	Other Forms Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Many	Trochospheres of *Polynoë* and older stages with scales Larvæ of *Nerine*		Thysanopods Swarm of Copepods				*Ceratium tripos* at bottom
				Schistomysis ornata				Infusoria
				Crangon vulgaris, several *Parathemisto oblivia*, many adult and young				
	A few good			*Parathemisto oblivia*, in swarms				
				Swarms of *Parathemisto oblivia*	*Appendicularia* (?)			
		Adult *Scalibregma inflatum*		*Idotea linearis* *Parathemisto*, a few *Schistomysis ornata* *Amathilla sabini* ♀ with ova, pale brownish				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
21st January 1889. (3) Off West Rocks		All Sand	*Parathemisto oblivia*, many large and small *Acartia longiremis* *Sagitta*, a few, about ½ inch *Ceratium tripos*			Flounder, ¾ inch Sprats, many 1½ to 2 inches	*Aglantha digitalis (Circe rosea)*, very few	*Pleurobrachia*, very few, minute
22nd January 1889. ½ mile N.E. of Pier 2 p.m.	N. On Eden 3 fathoms	6 fathoms Sandy	*Parathemisto oblivia* *Aglantha digitalis (Circe rosea)*	1¼ hour 3.15 p.m.			*Tima bairdii*, about 1¾ inch and under *Aglantha digitalis (Circe)*, large	*Beroë*, 3½ inches, and one smaller
23rd January 1888. Close inshore at E. Sands	Along E. Rocks keeping about 50 yards from outer Rocks 1 fathom	All Sand						
24th January 1888. (1) About 1 mile N.E. of Pier head	4 fathoms.	All Sand		1 hour			*Aglantha digitalis (Circe rosea)*, and fragments of other Medusæ	
24th January 1889. (2) ½ mile Castle	N. To point opposite outer target 3 fathoms	5 fathoms Sandy	*Parathemisto oblivia*, many	¾ hour			*Aglantha digitalis (Circe rosea)* *Tima bairdii*, a few 1 inch *Aglantha digitalis (Circe rosea)*	*Pleurobrachia*, large and small

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Botto	**Tow-net.**						
		Very few, abou ½ inch		*Parathemisto oblivia*, very few Some very small				*Rhizosolenia*, very few in bottom tow-net
	Swarms	Young *Nerine*		*Parathemisto oblivia*, in swarms				
	Bottom	**Tow-net.**						
	A few ½ inch			*Parathemisto oblivia*, a few				*Ceratium tripos* Diatoms
				Parathemisto oblivia, large and small in swarms, most small *Amathilla sabini*, a few small Sessile-eyed forms (?)				
	A considerable numbe—reproductiv organs, comparatively small, but with ova in them. Curious parasitic Diatoms, near anus	Adult *Tomopteris*, numerous, mall		*Parathemisto oblivia*, a few				
	In swarms, some with Trematode larvæ; male elements largely developed in some	Adult *Tomopteris*		*Parathemisto oblivia*, many *Calanus finmarchicus*, etc., many				
	Bottom	**Tow-net.**						
	Numerous, ½ inch and upwards			*Calanus finmarchicus*, many *Pseudocalanus elongatus*, numerous				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size,	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
26th January 1889. Abreast of College, ½ mile N.	N. 2 fathoms	4 fathoms Sandy					*Stomobrachium octocostatum*	
28th January 1889. Pole Rock off W. Rocks	To Pier head, about 1 fathom				Ovum of green cod ?)			*Pleurobrachia*, *Lesueuria*, 3 inches
30th January 1888. N. from Castle	Towards opposite shore 4 fathoms	6 fathoms Sandy	*Parathemisto oblivia*, a few					
3rd February 1888. Off Union Club	Outwards n line between Red Head and Bell Rock	1 fathom to 5 fathoms					*Aglantha digitalis (Circe rosea)* in considerable numbers, one with peculiar parasite (?)	*Pleurobrachia*, many large
6th February 1888. Beyond Beacon at end of Pier	Towards Bell Rock to point opposite Kinkell Ness	Sandy						
7th February 1888. From Pipe	E. To opposite Kinkell Ness 2 fathoms	Sandy	*Parathemisto oblivia*, a few					

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	In swarms	Adult *Tomopteris*, a few						*Ceratium furca*
	Bottom Tow-net.							
—	—	—	—	*Calanus finmarchicus* *Diastylis rathkii*, young	—	Young *Spirialis*	—	*Tintinnus denticulatus* *Ceratium tripos*, numerous Spores of algæ Peculiar algoid body Diatoms
Larval starfish like *Cribrella*	In swarms, few 1 inch, and swarms of less	Adult *Tomopteris*		*Parathemisto oblivia* (as before), in swarms *Calanus finmarchicus*	A few veligers and bivalves			Spores of algæ and fragments
				Parathemisto oblivia, in swarms, males showing spermatozoa, most young, one containing ova of Ascaris and another. Two Ascidians				2 Ascarids in *Parathemisto*, and in another several large ova of Ascaris
	Considerable number	*Tomopteris*, numerous, small		*Amathilla sabini* 1 *Eurydice pulchra* *Parathemisto oblivia*, considerable number				
	2 about 1⅛ inch			1 *Amathilla sabini* *Parathemisto oblivia*, numerous, males developing spermatozoa				
				Parathemisto oblivia, numerous				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
9th February 1888. Off bar of Eden.	Almost N.	Sandy						*Tima bairdii*, small
11th February 1888. Off Pier head 2 miles	To 4 miles from W. Sands. 3 fathoms.	Sandy						*Pleurobrachia*, a few
12th February 1888. ½ mile from Beacon	Towards Bell Rock at surface	Sandy						*Thaumantias*, a few
12th February 1889. ½ mile N.E. of Pier	S.	5 fathoms Sandy						Ova of *Pleurobrachia*
13th February 1888. 2 miles beyond Pier	2 miles towards Bell Rock							
13th February 1889. 2 Miles N.E. of Pier 9.30 a.m.	4 fathoms	7 fathoms Sandy	1 *Idotea linearis*, *Pseudocalanus elongatus* *Sagitta*, very few, ¾ to ⅝ inch *Aglantha digitalis (Circe rosea)*, very few, small, immature	1 hour 10.30 a.m.			*Aglantha digitalis (Circe rosea)*, a few	*Pleurobrachia*, a few large and small, ⅛ to ½ inch Number of *Beroë* and *Lesueuria*
							Aglantha digitalis (Circe rosea), very few, small, immature	

Mid-water Net.							Diatoms.	Other forms, greenish bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, &c.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
		Adult *Autolytus prolifer*, with eggs in pouch, Larval form of *Nereis*		*Parathemisto oblivia*, a few			A few	
				Parathemisto oblivia, numerous				
	A few			*Parathemisto oblivia*				
	Bottom	**Tow-net.**						
	A few large			Many Copepoda		Young *Spirialis*		
	Myriad, ⅜ to ⅝ inch Parasitic Nematode in some	*Nereis* as before Larval *Nerine* 8 segments and Trochosphere stage, adult *Tomopteris*, many, ¼ to ½ inch *Nereis* *Autolytus*, with ovisac		*Parathemisto oblivia*, in swarms *Boreophausia raschii*, many *Schistomysis ornata*, very few *Mysis vulgaris*, very few 1 *Atylus swammerdamii* *Parathemisto oblivia*, swarms. 1 *Eurydice pulchra* *Calanus finmarchicus*, a few *Pseudocalanus elongatus* Exuviæ of *Balanus*		Minute bivalves		
	Bottom	**Tow-net.**						
	A few mature			*Calanus finmarchicus*, a few *Pseudocalanus elongatus*, many				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of time Net down and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
14th February 1889. N. of inner Pier, 1 mile 9.45 a.m.	N. 3 fathoms	5 fathoms Sandy	*Pseudocalanus elongatus*, many *Autolytus prolifer*, ♀ bearing ova Sagitta, very few *Aglantha digitalis* (*Circe rosea*) very few	$\frac{7}{12}$ hour 10.20 a.m.			*Aglantha digitalis* (*Circe rosea*) many	1 *Pleurobrachia*, $\frac{7}{8}$ inch
							Aglantha digitalis (*Circe rosea*) a few large	
17th February 1888.			Reticulated larvæ of *Nerine* *Cyphonautes* Copepoda Young *Appendicularia*					
19th February 1889. 30 yards N.E. of Pier head 1.30 p.m.	N.E.	Sandy	*Parathemisto oblivia*, very few *Pseudocalanus elongatus*, numerous 1 *Tomopteris*, very small Sagitta, many (as before) *Aglantha digitalis* (*Circe rosea*) many as in other net	2 hours 3.30 p.m.	Ova of Plaice; Haddock; Long rough dab; Dab; Green cod?	At mouth of Forth many young wolf-fishes, 21 mm.		
21st February 1889. 3 miles N.E. of Pier head 2.30 p.m.	S.W. 3 fathoms	6 fathoms	*Acartia longiremis*, many *Calanus finmarchicus*, very few	$\frac{3}{4}$ hour 3.15 p.m.			*Aglantha digitalis* (*Circe rosea*) a few	
			1 Sagitta *Aglantha digitalis* (*Circe rosea*) a few					Minute *Pleurobrachia* Ephyræ of *Aurelia*

Mid-water Net.							Diatoms.	Other forms, greenish bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Myriad			*Atylus swammerdamii*, very few *Parathemisto oblivia*, numerous *Calanus finmarchicus*, many				
	Bottom	**Tow-net.**						
	Many, mature, one with parasitic Nematode			*Schistomysis ornata*, very few 2 *Atylus swammerdamii* *Calanus finmarchicus* and *Pseudocalanus elongatus*, numerous				
17 ova of Echinoderms (*Luidia* ? *Cucumaria*?)			Nauplii, a few		*Cyphonautes*			*Ceratium tripos* and algæ
	Bottom	**Tow-net.**						
	Many, as before	Adult *Tomopteris*, a few, about ½ inch	Nauplii, many (chiefly off rocks)	*Schistomysis ornata*, very few, small *Parathemisto oblivia*, many *Calanus finmarchicus*, many *Pseudocalanus elongatus*, numerous				
	Many			*Parathemisto oblivia*, numerous *Calanus finmarchicus*, many				
	Bottom	**Tow-net.**						
	A few	Larval *Nerine*		*Parathemisto oblivia*, many *Calanus finmarchicus*, numerous Copepoda in considerable numbers				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of time Net down and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
26th February 1889. Midway between Bell Rock and Carr Rock			*Parathemisto oblivia* *Calanus finmarchicus*, very few Sagitta, very few Larval *Nerine*? Larval *Appendicularia*		Ciliated minute ovum in morula stage Larva E. Clupeoids Sand-eels		*Aglantha digitalis* (*Circe rosea*), a few	Ephyræ of *Aurelia*
2nd March 1888. Off Beacon	To Tent's Muir 3 fathoms			1½ hour	Ova of plaice and gurnard	Larval sand-eels	*Aglantha digitalis* (*Circe rosea*)	*Pleurobrachia*
6th March 1888. 100 yards off E. Rocks	To mouth of Eden 1¾ mile 3 fathoms				Ova of Haddock Ova of cod ,, long rough dab Ova of dab ,, rockling (3 bearded)		*Aglantha digitalis* (*Circe rosea*)	
7th March 1889. ¼ mile E. of Kinkell Ness, and 1 mile N. of Kinkell Ness 11.30 a.m.	To Eden	8 to 6 fathoms Sandy	Eggs of haddock, long rough dab, cod, plaice and rockling	¾ hour 12.15 p.m.	2 eggs of Plaice embryo about to issue from egg Egg of dab Larval sand eels	1 of Cottus (?) 7 mm. With no appearance of fin rays Montagus sucker 5·2 mm.	*Aglantha digitalis* (*Circe rosea*) many	*Cyanea*, a few minute Two *Aureliæ*? minute Eggs and larvæ of *Peachia*
8th March 1889. 1½ mile N.E. of Kinkell Ness 2.30 p.m.	Towards Harbour 4½ fathoms	8 to 7 fathoms Sandy	*Parathemisto oblivia* *Halitemora longicornis*, many *Pseudocalanus elongatus*, very few Nauplius, a few Pluteus		Crustacean (?) in morula stage Sand eels 5 mm. Montagus sucker 4·5 mm. Cœlenterate ova		*Aglantha digitalis* (*Circe rosea*) Myriad 1 *Tima bairdii* 2¼ inches	1 *Pleurobrachia* ¾ inch *Cyanea* minute, very few 1 *Pleurobrachia* ⅝ inch

Mid-water Net.							Diatoms.	Other forms, greenish bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
	In swarms, chiefly small	Adult *Autolytus* ♂ *Tomopteris*, small Bristles of *Harmithöe*		*Thysanoessa*, *Calanus finmarchicus*, a few	*Cyphonautes*	*Spirialis* *Clione*, a few		*Ceratium tripos*, a few *Ceratium furca*, a few *Rhizosolenia*, a few Many spores of algæ Diatoms, many
	Numerous Some fine	Multitudes of the Larvæ of *Nerine* Adult *Autolytus prolifer*		*Parathemisto*, very few Thysanopods (*Nyctiphanes and Thysanoessa*) *Calanus (?)*		Young *Ommastrephes* 1 inch long		
	Large and small			A few small crabs				
	Bottom	**Trawl-net**						
Minute brittle-stars	Myriad	*Tomopteris*, a few small *Autolytus* ♂ several 2 small bearing ova	Nauplii abundant for a fortnight Zoëa of *Crangon*	*Parathemisto oblivia*, very few *Calanus finmarchicus*		A few young mussels, 1·5 mm., and other minute bivalves A few veligers of *Littorina*		*Ceratium tripos*, very few. Diatoms, many
	Myriad	*Autolytus prolifer* ♀ bearing ova (2)		*Crangon vulgaris*, a few, large and small *Schistomysis ornata* a few *Calanus finmarchicus* numerous *Acartia longiremis*, a few				
	Bottom	**Tow-net.**						
	Many	*Nerine*, adult. *Autolytus prolifer* ♂ one other form	Nauplius	*Calanus finmarchicus*, a few *Pseudocalanus elongatus* myriad *Halitemora longicornis*, very few		*Spirialis*, a few		Diatoms in bottom and surface tow-nets

Net put down, where and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of time Net down and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
11th March 1889 500 yards N.E. of Pier head 9 a.m.	Towards Targets 3½ fathoms	5 fathoms Sandy	*Halitemora longicornis*, very few *Pseudocalanus elongatus*, very few Nauplii, very few Sagitta, very few	1 hour 10 a.m.	2 eggs of rockling	3 clupeoids, 8·5 mm. 10 mm. A few Gobies Pipe fish (*Syngnathus acus*) 2½ inches 1 herring (?) 1⅞ inch		
12th March 1889. Targets 8.30 a.m.	N.E. 3½ fathoms	5 fathoms Sandy		½ hour 9 a.m.	1 of plaice Sand eels	Sprats 1¼ to 2 inches		
Targets 9.30 a.m.	N.E. 3½ fathoms	5 fathoms Sandy		½ hour 10 a.m.	1 of Cod	2 Cotti *Agonus cataphractus*, many herrings	*Aglantha digitalis* (*Circe rosea*) 1 *Bougainvillia britannica*, minute	*Cyanea* minute, very few
15th March 1889. 1 mile abreast of Kinkell Ness 10 a.m.	To Harbour 4½ fathoms	8 fathoms Sandy and rocky	*Calanus finmarchicus*, very few *Pseudocalanus elongatus*, very few Nauplii in swarms	1¼ hour 11.15 a.m.	1 of plaice	6 clupeoids, 8·10 mm. Permanent rays appearing in tail Herrings many as before	*Aglantha digitalis* (*Circe rosea*) very few	Fragments of *Lesueuria*
					Egg of *Motella*	1 clupeoid, 9·5 mm., no appearance of permanent rays	*Aglantha digitalis* (*Circe rosea*)	
22nd March 1889. 400 yards off Pier 1.40 p.m.	To Targets 3½ fathoms	5 fathoms Sandy	*Halitemora longicornis*, very few Zoëa Larval *Lesueuriæ*, minute *Aglantha digitalis* (*Circe rosea*), many		Eggs of plaice, embryo far advanced Larval sand eels (many)	Clupeoids, numerous, 8 to 9 mm. on average 1 *Agonus cataphractus*, sand eels, a few Young Cotti	1 *Tima bairdii*, 1¾ inches, unripe *Aglantha digitalis* (*Circe rosea*) myriad, some ripe 1 *Bougainvillia britannica*, very small	*Cyanea*, minute, many Fragment of *Lesueuria* 3 *Pleurobrachia*, inch

Mid-water Net.							Diatoms.	Other forms greenish bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Myriad as before			*Schistomysis ornata*, many *Mysis vulgaris*, very few *Mysis griffithsiœ*				Diatoms in surface net
	Bottom	**Tow-net.**						
	Very few		Nauplii, very few Zoëæ	*Diastylis rathkii*, one *Caligus* *Parathemisto oblivia* *Pseudocalanus elongatus*, very few				
				Schistomysis ornata, very few *Parathemisto oblivia*, very few *Calanus finmarchicus*, a few				
	Bottom	**Trawl-net**						
	Numerous as before	*Adult Autolytus prolifer* 3 ♀ bearing ova	Nauplii Zoëæ, many of *Carcinus* and *Crangon*	*Schistomysis ornata*, very few *Parathemisto oblivia*, a few *Calanus finmarchicus*, many		*Spirialis*, very few		Diatoms, many
		Adult 1 *Tomopteris*, 1 inch		*Schistomysis ornata*, very few *Parathemisto oblivia*, many *Calanus finmarchicus*, many				
	Bottom	**Tow-net.**						
			Nauplii myriad	*Calanus finmarchicus*, very few *Pseudocalanus elongatus*, very few *Halitemora longicornis*, very few				
	A few (as before)	Adult *Tomopteris*	Zoëæ, very few	1 *Mysis*? *Atylus swammerdamii*, very few *Parathemisto oblivia*, a few *Eurydice pulchra*, 3 *Idotea linearis* (3), very small				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of time Net down and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, &c.	Hydromedusæ.	Medusæ.
5th April 1888. In line with Kinkell Ness	To Maiden Rock 4 fathoms				Haddock, plaice, cod and rockling, a few (Also in bottom-net)			Young forms. *Hybocodon*
6th April 1888. 7 miles E. of Bell Rock		Sandy	Eggs of cod and plaice					
9th April 1888. 4 miles from Pier and 2 miles N.E. of Kinkell Ness 7 miles E. of Bell Rock		Sandy Sandy	 Eggs of dab and rockling Many Crustaceans, Daphnia-like		Eggs of plaice and rockling			
12th April 1888. 2 miles off Kinkell Ness, and 2 miles from Pier head	4 fathoms	Sandy			Eggs of cod, haddock, plaice, dab, flounder, rockling and weever *(Trachinus vipera)*	Sprat, 2 inches		Some young *Pleurobrachia*
14th April 1888. Pier head	Towards Tay lightship for 1½ miles	Sandy	Many eggs of haddock, cod, long rough dab, plaice, dab, flounder and rockling		Many eggs of plaice, haddock, cod, dab, sprat, rockling Clupeoids, 6·4 to 7·5 mm.	Sand eels 5·8 mm. Agoni 5·5–7·5 rockling 4·5 mm. Plaice, 7·5 mm. Cotti, 5·2 mm.	Some	
18th April 1888. Kinkell Ness	N. 3 fathoms				A few eggs of plaice and long rough dab Sand eels in swarms Montagu's sucker *Agonus cataphractus*	Gunnels, 17 mm.		*Pleurobrachia*, numerous, small
19th April 1888. 20 miles S.E. of N. Carr Rock			Eggs of haddock, cod, long rough dab, sprat, plaice, dab, turbot (one) and rockling, many Zoëæ		24th April Eggs of gurnard, sprat and long rough dab, many sand eels	Clupeoids 7·5 mm. to 9·2 mm.		

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
			Zoeæ					
		Adult *Autolytus prolifer*						
	A few			*Talitrus*-like form, *Daphnia*				
	Many	Many Adult *Nereis dumerilii* (Epitocous form)	Many	*Hyperia* (?) *Eurydice*, *Idotea linearis* and *tricuspidata*				
	Swarms, chiefly about ¼ inch			*Idotea*, and many stalk-eyed transparent shrimp-like forms (*Mysis*)	A few young forms	*Clione*, many		

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size,	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
26th April 1888. 300 yards off Pier 10.30 a.m.	N.E. 500 yards just in line with Pier head 3 fathoms	6½ fathoms Sandy	Numerous Copepoda, *Centropages hamatus* and *Calanus finmarchicus*	½ hour 11 a.m.	Few of plaice, cod, and whiting, one of flounder and poor cod, 25th April 1887 *Cottus*, 7 mm.	1 goby, 1⅝ inch Young flounders, $\frac{7}{16}$ to $\frac{9}{16}$ inch, and one $1\frac{1}{16}$ inch Dab, 27 mm.	Pelagic Medusoid eggs	
30th April 1888. 3 miles E. of Pier head, and 3 miles from Kinkell Ness 1 p.m.	To Maiden Rock 4 fathoms	7 to 9 fathoms Sandy	A few eggs of rockling Numerous Copepoda *Centropages hamatus* *Calanus finmarchicus* and *Halitemora longicornis*	1 hour 2 p.m	A large number of ova, viz.:—of plaice, gurnard, long rough dab and rockling	5 gadoids, ¼ to 1½ inch 8 sand-eels, ¾ inch	Few. *Thaumantias* and *Lizzia punctata*	*Pleurobrachia*, many
4th May 1888. 100 yards off Pier in line with middle of Pier and Scoonie Hill 7 a.m.	To point about half-way between Eden and Pier 3 fathoms	6½ fathoms Sandy	Young Decapod *Cuma* *Centropages hamatus*, ♂ and ♀ *Halitemora longicornis* and *Acartia longiremis* numerous *Nauplii*	1 hour 8 a.m.	Not nearly as numerous as last day Eggs of plaice, gurnard and haddock	4 gadoids, ¼ inch 3 sand-eels, ⅝ inch	Numerous. *Sarsia tubulosa* and *pulchella* and *Thaumantias*	*Cyanea*, in great numbers *Pleurobrachia*, in great numbers
9th May 1888. (1) Abreast of Castle 10.15 a.m.	E.N.E. To point where Scoonie Hill in line with Pier head 3 fathoms	4½ to 6 fathoms Sandy	A few *Appendiculariæ*, Larval Mollusca (?) *Calanus finmarchicus* *Halitemora longicornis* *Nauplii*	1 hour 11.15 a.m.		8 gadoids, ⅝ inch 3 gadoids, $\frac{5}{16}$ inch 1 gadoid, ½ inch, 1 sand-eel, ½ inch	*Sarsia tubulosa*, a few 2 *Sarsia pulchella*, 1 *Phialidium variabile*, var. *globosa* (?)	1 *Pleurobrachia*
(2) Near mouth of Eden 12 noon	S. To point where Scoonie Hill in line with Pier head			½ hour 12.30 p.m.		4 gadoids, ¼ to $\frac{7}{16}$ inch	*Sarsia tubulosa* and *Thaumantias*, a few	
10th May 1888. Half-way between Kinkell Ness and Budda Rock 11 a.m.	To Eden mouth 4 fathoms	8 fathoms Sandy	1 Copepod, *Halitemora longicornis* 3 *Sagittæ*, ¼ to ½ inch	¾ hour 11.45 a.m.		7 gadoids, $\frac{5}{16}$ to $\frac{9}{16}$ inch 2 flounders, $\frac{7}{16}$ to ⅝ inch 1 clupeoid, ⅜ inch	*Sarsia tubulosa*, a few *Phialidium variabile*, var. *globosa*, 2 1 *Thaumantias*	1 *Cyanea*, *Pleurobrachia*, a few
Harbour, 2 p.m				2 hours 4 p.m.		2 flounders, ½ inch	1 *Stauridium productum*	

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
		A few adult Nematodes	Pelagic ova	1 *Crangon vulgaris*, *Mysis vulgaris*, *Schistomysis ornata*, *Diastylis rathkii*, a few				
	Numerous, ⅝ inch	Adult *Tomopteris*	Zoeæ numerous	*Parathemisto oblivia*, *Eurydice*, a few *Calanus finmarchicus*	*Appendicularia*, 3			
	Numerous, ¼ to 1 inch, one or two with parasitic Nematode	Adult. 2 *Nereis* and *Syllis*, latter bearing blue mass of eggs	2 Zoeæ	2 *Parathemisto oblivia*	*Appendicularia*, many		Numerous spicular forms	
	1, 1 inch			*Parathemisto oblivia*, 3 *Amphithoe* 1 *Eurydice* 1 Copepod, *Calanus finmarchicus*	*Appendicularia*, in swarms		*Rhizosolenia* amongst 'houses' of *Appendicularia*	Infusorians amongst 'houses,' of *Appendicularia*
					Appendicularia, in swarms			
			Zoeæ, a few	2 *Parathemisto oblivia* 1 Copepod, *Calanus finmarchicus*	*Appendicularia*, in swarms		*Rhizosolenia* in abundance in surface net	
				Schistomysis ornata, a few 3 *Amphithoe littorina* 2 *Gammarus locusta*,				2 larval insects

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
11th May 1888. (1) Opposite Spindle Rock 12.15 p.m.	N.W. for 500 yards 4 fathoms	6 fathoms Rocky	2 Copepods, unrecognisable, and *Halitemora longicornis* (?) Ova of Holothurian (?), a very few	½ hour 12.45 p.m.		2 sand-eels, ⅜ to ½ inch	1 *Sarsia tubulosa*	
(2) 500 yards N.W. of Spindle Rock 1 p.m.	N.W. along shore keeping 150 yards off low water rocks, 2 fathoms	6 to 5 fathoms Rocky	Eggs of gurnard, haddock, poor cod, sprat, dab, lemon dab, and rockling, Ova of Holothurian (?), a few	2 p.m.		2 sand-eels, ⅝ to 9/16 inch 2 *Gadus virens* (?), ⅝ to ⅞ inch 2 flounders, 9/16 inch	*Laodice cruciata*, (*Thaumantias pilosella*), a few *Thaumantias melanops*, a few *Sarsia pulchella* and *tubulosa*, a very few 1 *Stauridium productum*	*Pleurobrachia*, a few
15th May 1888. 2 miles N.E. of Pier 4 a.m.	N.W. 3 fathoms	6½ to 4½ fathoms Sandy	Eggs of topknot and others as above	1½ hour 5.30 a.m.			*Sarsia tubulosa*, many *Laodice cruciata* (*Thaumantias pilosella*) *Thaumantias melanops*, a few *Stauridium productum*, a few *Margelis ramosa* (*Bougainvillia britannica*) 1 *Lizzia octopunctata*	*Cyanea*, many *Halistemma* (bottom-net)
16th May 1888. 1½ mile E. of Pier, and 2 miles N.E. of Kinkell Ness 8 a.m.	W. 3½ fathoms	7 fathoms Sandy		½ hour 8.30 a.m.		4 *Gadus virens*, 11/16 inch, with parasitic *Caligus*	*Sarsia tubulosa*, a very few	1 *Cyanea* of pinkish hue, ¼ inch
17th May 1888. 1 mile E. of Pier 4.30 p.m. E. of Maiden Rock 5.15 p.m.	N.W.		A few *Appendicylariæ* 2 *Sagittæ*, ⅜ and ½ inch	⅙ hour 4.50 p.m. ⅙ hour 5.25 p.m				

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
				Parathemisto oblivia, a few *Gammarus marinus* (?) and *locusta* 1 *Amphithoe littorina*	*Appendicularia*, in swarms		*Rhizosolenia* in abundance in mid-water and surface nets	
				Parathemisto oblivia, a few 2 *Amphithoe littorina*, *Eurydice pulchra*, a few	*Appendicularia*, in swarms		*Rhizosolenia* in abundance in mid-water and surface nets	
	1, $\frac{15}{16}$ inch, with parasitic Nematode			1 *Amphithoe littorina* 1 *Atylus swammerdami* 1 *Eurydice*	*Appendicularia*, in swarms		*Rhizosolenia* in abundance in surface net	
				1 *Atylus bispinosus* 1 *Caprella*	*Appendicularia*, in swarms		*Rhizosolenia* in abundance in 'houses' of *Appendicularia*, and surface net	1 larval insect
							Rhizosolenia in abundance	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size,	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
18th May 1888. (1) 55 miles S.E. of Bell Rock			1 *Idotea* Copepoda, many *Calanus finmarchicus* *Acartia longiremis* and *Longipedia coronata*					
(2) ¾ mile E. of Pier 8.40 a.m.	W. by Baths to Roman Catholic Church 2 fathoms	6½ to 3½ fathoms		1⅙ hour 9.50 a.m.	Eggs of rockling	6 gadoids, ⅜ to $\frac{11}{16}$ inch	*Laodice cruciata* (*Thaumantias pilosella*), very few 1 *Thaumantias melanops* *Sarsia tubulosa*, very few 1 *Sarsia pulchella*	2 *Beroë*
(3) ¾ mile E. of Pier 4.30 p.m.	N.		*Appendicularia*, a very few 2 *Sagittæ*, ¼ and $\frac{9}{16}$ inch 1 *Beroë*	¼ hour 4.45 p.m.				
19th May 1888. N. of Eden 9.26 a.m.	To 100 yards E. of Pier 3 fathoms	5½ to 4½ fathoms Sandy	*Appendicularia*, a very few *Calanus finmarchicus* *Longipedia coronata* 2 *Sagittæ*, $\frac{5}{16}$ and $\frac{1}{9}$ inch	1⅙ hour 10.30 a.m.		31 gadoids, ¼, ⅜ and ⅛ inch, smallest with embryonic, median fin; post-larval caudal fin appearing	*Sarsia tubulosa*, a few	*Pleurobrachia*, numerous, pinkish coloration *Lesueuria vitrea*, numerous ¾ to 1½ inches
22nd May 1888. (1) 2½ miles of Boarhills, and 4 miles E. of St Andrews 10.30 a.m.	N. 5½ fathoms	9½ to 9 fathoms Sandy	1 Copepod, *Halitemora longicornis*	1 hour 11.30 a.m.		2 gadoids, ⅜ and ¾ inch, former with post-larval caudal fin appearing, embryonic median fin	*Laodice cruciata* (*Thaumantias pilosella*)	
(2) Point where net drawn up at 11.30 a.m. 11.45 a.m.	W. 3½ fathoms	9 fathoms Sandy		¾ hour 12.30 p.m.		1 gadoid, ⅝ inch	*Sarsia tubulosa*, a few *Laodice cruciata* (*Thaumantias pilosella*) ova (?)	*Lesueuria vitrea*, numerous *Pleurobrachia*, many
23rd May 1888. Midway between Pier head and Kinkell Ness, 2 miles from shore 11.30 a.m.	S. 3 fathoms	7¼ fathoms Sandy	Ovum of Holothurian	1 hour 12.30 p.m.			*Sarsia tubulosa*, many *Laodice cruciata* (*Thaumantias pilosella*), a very few	*Lesueuria vitrea*, numerous *Pleurobrachia*, numerous

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
							Rhizosolenia, very few	
					Appendicularia, a very few			
							Rhizosolenia in abundance	
			Balani in *Cypris*-stage				*Rhizosolenia* abundant in surface net	
				1 Copepod *Halitemora longicornis*	*Appendicularia*, numerous		*Rhizosolenia* abundant in both nets	
							Rhizosolenia in surface net	
							Rhizosolenia, in surface net	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
24th May 1888. 2½ miles E. of Pier, 3 miles N. of Kinkell Ness, 11.15 a.m	W. 3 fathoms	9 fathoms Sandy	Eggs of rockling 13 Copepoda, *Halitemora longicornis* Exuviæ of *Balani*	¾ hour 12 noon			*Sarsia tubulosa*, a few 1 *Sarsia pulchella*	*Lesueuria vitrea*, many *Pleurobrachia*, many
26th May 1888. 3 miles from shore Midway between Kinkell Ness and Pier 11.50 a.m.	W.S.W. 3 fathoms	6½ fathoms Sandy	Copepoda, *Halitemora longicornis*, a few Exuviæ of *Balani*	⅔ hour 12.30 p.m.	Many of gurnard, all showing embryo with pigmented yolk and lens fully formed A few ova of brill (?)	3 gadoids, 11, 19 and 24 mm.	*Thaumantias lucida (?)*, brick red marginal ocelli, numerous and rather thick tentacles *Sarsia tubulosa*	*Lesueuria vitrea*, very few
28th May 1888. 4 miles E. of Pier, 3 miles from Kinkell 1.30 p.m.	W.S.W. 4 fathoms	8½ to 6½ fathoms Sandy	1 Copepod, *Centropages hamatus* Exuviæ of *Balani*	1⅓ hour 2.50 p.m.	Many ova of gurnard, sprat, dab, cod, haddock, whiting, brill (a few)	1 *Cottus*, 9 mm., permanent caudal rays scarcely apparent 8 gadoids, 2·5 mm. to 20 mm., smallest exhibiting permanent rays in caudal fin 5 sand-eels, 18 mm to 20 mm., one partially digested by *Pleurobrachia* 3 flounders, 9 mm. to 15 mm.	2 *Thaumantias melanops* *Sarsia tubulosa*, a few	*Lesueuria vitrea*, a few *Pleurobrachia*, many
1st June 1888. Near Pier, in line with Scoonie Hill and end of Pier 10.30 a.m.	N.E. 2½ fathoms	5 fathoms Sandy		¾ hour 11·15 a.m.		18 gadoids, 7·5 mm. to 24 mm., smallest with mere trace of permanent rays in caudal fin 6 flounders, 9 mm. to 12 mm., with eye on each side of head, and permanent rays present in smallest	*Thaumantias pileata*, a few *Thaumantias melanops*, many *Laodice cruciata* (*Thaumantias pilosella*), numerous *Thaumantias, (?)*, a few 1 *Margelis ramosa* (*Bougainvillia britannica*)	*Lesueuria vitrea*, in swarms *Pleurobrachia*, very few

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
					Appendicularia, a few		*Rhizosolenia*, a few	
					Appendicularia, in swarms		*Rhizosolenia*, a few in both nets	
		1 adult *Tomopteris*	Megalops, a few Zoeæ, a few	Young *Hyperia*	*Appendicularia*, in swarms		As before	
							Rhizosolenia, numerous	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
7th June 1888.								
Scoonie Hill in line with Coast Guard Flagstaff, 3 miles from shore 10.40 a.m.	S.	Sandy		2 7/12 hours 1.15 p.m.	10 *Agonus cataphractus* 23 *Gobius minutus* *Pleuronectes limanda* and *platessa*, many large and small, 3 clupeoids, 5 gurnards	*Gadus virens* (?), 33 mm. Gadoid, 27 mm. 9 flounders, 4·5 mm. to 9 mm. 3 *Agonus cataphractus* 10·5 mm.	Hydroid Zoophytes	
1 mile N.E. off Kinkell Ness 11.40 a.m.	Towards Harbour	8·6 fathoms Sandy		1¼ hour 12·50 p.m.	7 *Trigla gurnardus* *Gobius minutus*, very many, 1 whiting 7 *Agonus cataphractus* *Pleuronectes limanda*, 6 saleable, 3 unsaleable *Pleuronectes platessa*, 3 saleable, 16 unsaleable	5 flounders, 6, 7, 7·3, 13 mm. 1 clupeoid 1 *Agonus cataphractus*, 11 mm.	Hydroid Zoophytes	2 *Pleurobrachiæ*, small
11th June 1888.								
2 miles from Pier, 1 mile off Kinkell Ness. 12.15 p.m.	Towards Pier	Sandy	Eggs of rockling (3 bearded?) A few Ostracoda	½ hour 1.30 p.m.	A few of gurnard Larval *Cyclopterus lumpus*, 5 mm.		*Sarsia tubulosa*, many *Thaumantias melanops* *Laodice cruciata* (*Thaumantias pilosella*), very few, *Thaumantias lucida* numerous, *Margelis ramosa (Bougainvillia britannica)*, a few *Lizzia octopunctata*, and 2 other forms.	*Cyanea*, a few, larger than before and yellowish *Pleurobrachia*, many

Ground Trawl.								
Larval chinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Adult Echinoderms Two sandstars	2 adult		*Schistomysis ornata*, numerous 1 *Crangon vulgaris* 1 *Cancer* (*Corystes*) *cassivelaunus* *Cuma trispinosa* *Diastylis rathkii*, numerous 1 *Atylus swammerdami* *Allorchestes nilssonii*, very few 7 *Idotea linearis*				
	A few sandstars 1 heart-urchin	2 adult *Autolytus*		*Schistomysis ornata*, numerous 1 *Crangon vulgaris* 1 small hermit-crab 1 *Cancer cassivelaunus* *Portunus holsatus*, myriad 3 *Diastylis rathkii*, numerous *Atylus swammerdami*, a few *Nisea lubbockiana*. a few				
	Mid-	**water Net.**						
	Many, 15 mm.	1 adult *Tomopteris*	Megalops, a few Zoeæ, many with long spines	1 *Pandalus annulicornis* 1 *Hippolyte* (?)	*Appendicularia*, many			Exuviæ of *Balani*, a few A few Infusoria in mid - water net

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
12th June 1888. Midway between Pier and Kinkell Ness 1.10 p.m.	To about 200 yards from Pier keeping ½ mile off shore	Sandy and partly rocky		⅚ hour 2 p.m.	Many of gurnard, some with blastoderm multicelled, and others with embryo far advanced Larval *Cyclopterus lumpus*, 5 mm.	2 gadoids, 10 and 17 mm., former with secondary rays apparent only in caudal region	Swarms :— *Thaumantias inconspicua*, *lucida*, *hemisphærica*, and *melanops*, *Laodice cruciata (Thaumantias pilosella)*, *Phialidium variabile* (var. *globosa)* *Margelis ramosa (Bougainvillia britannica)*, Fragment of *Stauridium*, *Sarsia tubulosa*	*Lesueuria vitrea* in swarms, young and adult *Pleurobrachia*, very few
13th June 1888. Abreast of Maiden Rock 1.10 p.m.	To middle of west sands 4¾ fathoms	6 fathoms Sandy		$1\frac{1}{12}$ hour 2.15 p.m.	Gurnards, numerous, some with blastoderm multicelled, and others with pigmentation on embryo and yolk-sac, Larval *Cyclopterus lumpus*, 6 mm.	4 gadoids, 7, 7·5, 8 and 10 mm., the smallest with permanent rays in caudal region 3 flounders, 6, 9 and 12 mm., with eyes on both sides of head, and swimming on edge, no permanent rays in tail of smallest	Swarms :— *Sarsia tubulosa* ,, *pulchella* (?), with reddish ocelli, *Thaumantias hemisphærica*, *inconspicua*, *melanops*, *octona* (?), and *gibbosa*, (pinkish), *Laodice cruciata (Thaumantias pilosella)*, *Epenthesis maculata* *Margelis ramosa (Bougainvillia britannica)*, 2 *Lizzia octopunctata*	*Beroë*, very few *Lesueuria vitrea*, in swarms—young and adult, *Pleurobrachia*, numerous, large and small

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Very few	Young *Magelona* *Phyllodoce* *Eulalia*, *Polydora* and *Sabellaria*			*Appendicularia*, very few			
	Very few	Adult *Tomopteris*, a few large and small		*Hippolyte* (?) *Caligus*, with parasitic *Udonella caligorum*	*Appendicularia*, many			

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
15th June 1888. ½ mile from Pier rocks with (1) Scoonie Hill in line with Gas Works chimney 10 a.m.	E. 2 fathoms	4 fathoms Sandy		1 hour 11 a.m.	Gurnard a few, with blastoderm multicelled, and others with pigmented embryo	1 *Gadus morrhua*, showing tessellated arrangement of pigment 1 *Cyclopterus lumpus*, 9 mm.	Numerous :— *Sarsia tubulosa*, small, *Margelis ramosa* (*Bougainvillia, britannica)*, very few, not quite ripe, *Laodice cruciata* (*Thaumantias pilosella)* *Phialidium variabile* var. *globosa*, not quite mature, *Thaumantias melanops*, nearly ripe, *Thaumantias octona* immature, *Thaumantias hemisphærica*, mature, *Thaumantias inconspicua*, immature,	*Lesueuria vitrea*, many, young and adult *Pleurobrachia*, many
(2) From end of former trawl 12 noon	N. to Eden mouth 2½ fathoms	3 fathoms Sandy	......	½ hour 12.30 p.m.	Same as before	......	Same as above, but not so numerous	Same as above, but not so numerous
16th June 1888.					1 Cephalopod, with spermatophores A few Copepoda			
18th June 1888. 1 mile N.E. of Pier 9.30 a.m.	W.S.W. 3 fathoms	6½ fathoms Sandy		hour 10 a.m.	Same as before		*Sarsia tubulosa* *Thaumantias gibbosa*, *hemisphærica*, *octona*, *lucida*, and *melanops*, as before, *Laodice cruciata* (*Thaumantias pilosella*), as before, *Margelis ramosa* (*Bougainvillia britannica*), as before 1 *Oceania episcopalis*	*Pleurobrachia*, as before *Lesueuria vitrea*, as before

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
		Young *Mitraria*		*Caligus*, with parasitic *Udonella caligorum*				
				Allorchestes nilssonii *Caligus*, 4 ♂ and ♀, latter very mature				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size,	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
23rd June 1888. 3¼ miles E.N.E. off Pier 10.45 a.m.	Towards Pier 14½ fathoms	10 fathoms Sandy	A few Copepoda:— *Halitemora longicornis*, *Centropages hamatus*, and *Acartia longiremis*, A very few Ostracoda, Megalops stage of lobster. Diatoms	1½ hour 12.15 p.m.	Same as before		*Thaumantias hemisphærica*, many, mature 1 *Margelis ramosa* (*Bougainvillia britannica*) *Epenthesis maculata* (*Thaumantias maculata*), very ripe, *Sarsia tubulosa*, many small and immature	*Pleurobrachia*, very many, large (very ripe), and small
25th June 1888. 1 mile N.E. of Pier head 11.45 a.m.	To within 300 yards of Pier head near salmon nets 2½ fathoms	5 fathoms Sandy	Many Copepoda:— *Centropages hamatus*, *Acartia longiremis*, Cladocera, *Evadne nordmanni*, a very few A very few Zoeæ	2 hours 1.45 p.m.	A few as before		*Sarsia tubulosa* as before *Laodice cruciata* (*Thaumantias pilosella*), a few large, not quite ripe, *Thaumantias hemisphærica*, many as before, *Thaumantias* (?), large, not quite ripe, *Epenthesis maculata* (*Thaumantias maculata*), many, not so ripe as formerly	Very few fragments of *Lesueuria*, one whole, small *Pleurobrachia*, very many as before
26th June 1888. 1¾ miles N. of Pier head 12.45 p.m.		Sandy	Young Mollusca ·013 inch Cladocera, *Evadne nordmanni*, Many Infusoria, *Ceratium fusus* 1 Megalops	1¼ hour 2 p.m.	Solenette (*Solea lutea*), dab		*Sarsia tubulosa*, immature	

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Very few, 12 mm.	Young *Polygordius* Adult *Tomopteris*	Megalops, a few Zoeæ, a few	*Caligus*, many, ♂ and ♀			In surface and mid-water nets	Peculiar spicular bodies. Algoid (see sketch)
	Very few, 6 mm. to 14 mm.			1 *Montagua alderi*, ♀ ripe. *Caligus*, many, ♂ and ♀, mature			A few (see sketch) in surface net	Algoid forms (as before)
	Bottom	**Tow-net.**		*Acartia longiremis*				
	Bottom	**Tow-net.**						
Plutei, many			*Nauplii*, numerous	*Halitemora longicornis* Ostracoda, numerous *Evadne nordmanni*, myriad. *Calagus rapax*, M.-Ed.		*Post-larval* mussels, ·012 inch, ·0077 inch, ·008 inch *Spirialis*, a few	4 kinds in surface net, and 5 kinds in bottom net	*Tintinnus denticulatus* *Ceratium divergens* Spores of algæ and algoid as above in surface net. Algoid as before in bottom net

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
28th June 1888. 300 yards N.E. of Pier 2.20 p.m.	S. $4\frac{2}{3}$ fathoms 2 feet from bottom	5 fathoms Sandy	1 young lobster Young crabs, very few Ostracoda, very few Cladocera, *Evadne nordmanni*, very few Megalops, very few A very few *Plutei* Infusoria, *Ceratium fusus*	$\frac{1}{2}$ hour 3 p.m.				
2nd July 1888. 400 yards N.E. of Pier head 10 a.m.	N.E.	5 fathoms Sandy	Many eggs of gurnard with advanced embryos Many eggs of sprat with advanced embryos A few eggs of dab with advanced embryos Many eggs of rockling with advanced embryos A few of topknot (?) A few of lemon dab 1 embryo with yolk-sac 1 *Centropages hamatus* *Evadne nordmanni*, very few Exuviæ of *Balani*, very few *Ceratium divergens*, few *Tintinnus denticulatus*, very few	1 hour 11 a.m.	8 *Trigla gurnardus*, $3\frac{3}{4}$ to $4\frac{3}{8}$ inches, 1 saleable 1 *Agonus cataphractus*, $2\frac{3}{4}$ inches 1 sprat injured, probably $2\frac{1}{4}$ inches 1 whiting, unsaleable *Pleuronectes platessa*, 8 saleable, 5 unsaleable *Pleuronectes limanda*, 5 saleable, 6 unsaleable 2 thornback skates, saleable	5 flounders, 5·5, 7, 11, and 12 mm., smallest exhibiting eyes on each side of head, and permanent rays appearing in tail 5 gobies, 6, 10, 11 mm., smallest with permanent rays in tail		*Pleurobrachia*, very few
	2 feet from bottom	5 fathoms						Young *Pleurobrachia*, (see sketch) A few ova of *Lesueuria* (?) (see sketch)

Mid-water Net.							Distoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
Plutei, numerous		Larval, *Lagis*, *Magelona*, *Spirorbis*	1 Megalops *Nauplii*, numerous	*Halitemora longicornis* *Acartia longiremis* *Centropages hamatus*, numerous Ostracoda, abundant, *Evadne nordmanni*, myriad	*Appendicularia*, a few young (see sketch) *Cyphonautes*, many		4 kinds in surface net, numerous forms as before in bottom net	Infusoria:— *Tintinnus denticulatus* Algoid, as before, in surface net *Ceratium fusus*, *tripos*, and *divergens* Algoid as before in bottom net
	Ground	**Trawl.**						
Adult Echinoderms 1 *Asterias*, broken test of *Echinus*		1 small *Nephthys*, young		*Mysis flexuosus*, numerous *Portunus holsatus*, numerous *Diastylis rathkii*, abundant *Anonyx edwardsii*, very many, large and small, ♀ carrying young *Atylus swammerdami*, very few Another sessile-eyed form				
	Bottom	**Tow-net.**						
Plutei, a few		1 *Wartelia*	*Nauplii*, numerous	Copepoda, in abundance *Acartia longiremis*, *Halitemora longicornis* Ostracoda, very few *Evadne nordmanni*, Lovén, numerous, many specimens with young in brood-pouch	*Appendicularia*, young, very few	*Post-larval* A few young mussels, ·01 to ·0125 inch *Spirialis*, a few	Many, same kinds as formerly	Infusoria, numerous *Ceratium divergens* and *fusus* *Tintinnus denticulatus* *Amphidinium operculatum* Algoid (as before)

Net put down where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
4th July 1888. 1½ mile N. off Pierhead 8.40 a.m.		4½ fathoms Sandy	1 small *Anonyx edwardsii* A very few larval Annelids, same as smallest in other nets	1½ hour 9.10 a.m.	2 *Pleuronectes limanda*, 2⅛ to 2¼ inches 1 *Syngnathus acus*			*Pleurobrachia*, very few
	2 feet from bottom	4½ fathoms			Pleuronectids, 11 mm. Lump-suckers, 9 to 10 mm.			
5th July 1888. 2 miles N.E. of Pier head 10 a.m.	Towards Kinkell Ness	5 fathoms Sandy and muddy		1½ hour 11.30 a.m.	18 *Trigla gurnardus*, 3⅛ to 5 inches 2 *Trigla gurnardus*, 7½ inches 1 sprat, 2¼ inches 2 whitings, 5½ to 6½ inches 70 *Pleuronectes limanda*, 2 to 3¼ inches 60 *Pleuronectes platessa*, 4 to 4½ inches 8 *Pleuronectes flesus*, saleable 20 *Pleuronectes platessa*, large, 12 inches 10 *Pleuronectes limanda*, largest 10 inches 1 *Raia clavata*, 16½ by 12½ inches	3 flounders, 8, 9, and 12 mm,, smallest with permanent rays appearing in tail		*Pleurobrachia*, a few ova shed

Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Ground	**Trawl.**						
		Form as in bottom tow-net, and a few tubes	*Nauplii*, a few	*Schistomysis ornata*, very few, young, one ♀ bearing ova *Diastylis rathkii* *Anonyx edwardsii*, a few *Atylus swammerdami*, a few 1 *Calliope læviuscula* 3 *Idotea linearis*			A few in ground-trawl	
	Bottom	**Tow-net.**						
Plutei, a few		Form in tube, *Nerine* (see sketch), Many small forms	*Nauplii*, abundant	Copepoda, many *Acartia longiremis* Ostracoda, very few *Evadne*, in abundance Other forms A few ova	*Appendicularia*, very few *Cyphonautes*	*Post-larval* Young mussels, ·012 inch A few young Pteropods	6 kinds, 4 as formerly	Infusoria, numerous *Tintinnus denticulatus* *Ceratium tripos* and *divergens* *Amphidinium operculatum* Algoid, as before
	Ground	**Trawl.**						
				Young shrimps, a few *Diastylis rathkii*, a few	Very few, young			

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
	2 feet from bottom	5 fathoms						
6th July 1888. N. of Pier head, 2 miles 10 a.m.	Towards Kinkell Ness 3 fathoms	5½ fathoms Sandy	*Natica* (?), a few Mussels, ·013 inch Ostracoda, very few (*Cypris* stage of Cirripede?) with diatoms growing on it 1 Zoea, Holoblastic ovum	1 hour 11 a.m.	A few of gurnard with embryo well advanced, pigmented A few eggs of sole	33 gobies, 3·5 mm. to 11 mm., smallest with permanent rays in tail	*Sarsia tubulosa*, many, small, immature 2 *Thaumantias melanops* *Thaumantias maculata* A few almost ripe, largest nearly ½ inch	2 *Lesueuria vitrea* *Pleurobrachia*, numerous, large, seemingly spent, a few small
Same place and time as before	2 feet from bottom	5½ fathoms Sandy		1 hour 11 a.m.				
7th July 1888. 1¾ miles E. of Pier head, and 1¾ mile N. of Kinkell Ness 10.30 a.m.	W. 4 fathoms	8 fathoms Sandy		½ hour 11 a.m.			*Thaumantias melanops*, many, and *hemisphærica* a few very ripe, about ⅝ inch	3 *Aurelia aurita*, largest 4 inches in diameter *Lesueuria* bearing ova, ·016 inch *Pleurobrachia*, many large and small as before
From point where net taken up last day 11 a.m.	Towards Boarhills, 2 feet from bottom	8 fathoms Sandy	*Halitemora longicornis*, a few *Evadne nordmanni*, *Nauplii*, numerous *Plutei*, a few Infusoria:—*Ceratium divergens* and *Amphidinium operculatum*	½ hour 11.30 a.m.	8 eggs with previtelline space and oil globule-like clupeoid, but no vesicles in yolk Egg of topknot (?)			

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Bottom	**Tow-net.**						
Plutei, numerous		*Nerine*, as before Small forms as before	*Nauplii*, numerous	*Acartia longiremis* *Halitemora longicornis*, abundant 1 *Caligus* Ostracoda, very few *Evadne*, many Brood-pouches filled	*Appendicularia*, very few, young *Actinotrocha*	*Post-larval Spiralis*, many Young mussels, ·013 inch, numerous		Infusoria:—*Tintinnus denticulatus* and *Ceratium divergens*
					Appendicularia, very few		2 kinds in surface net	
	Bottom	**Tow-net.**						
Many *Plutei*		*Nerine* (post-larval)	*Nauplii*, numerous	*Halitemora longicornis* Ostracoda very few *Evadne*, a few Ova in *Gastrula* stage		*Post-Larval Natica catena* (?) a few young mussels, ·013 inch	4 kinds as before	*Tintinnus denticulatus* Algoid (as before)
			Nauplii, very few	*Caligus*, a few ♀ bearing ova; one with parasitic *Udonella caligorum*			A few of 1 kind	
	Bottom	**Tow-net.**						
Plutei, a few		As before	*Nauplii*, abundant	*Halitemora longicornis* *Centropages hamatus* *Acartia longiremis* Ostracoda, very few *Evadne*, few Ovum in *Morula* stage			5 kinds in bottom, and 4 kinds in surface nets	Algoid (as before) both tow-nets Two forms (see sketch)

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net.)	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
10th July 1888. 200 yards N.E. of Pier 11.40 a.m.	Towards Eden 3½ fathoms	5 fathoms Sandy		½ hour 12.10 a.m.	Masses of eggs of frog-fish	1 goby, 8 mm., permanent rays appearing in tail	*Thaumantias hemisphærica*, many large, a few immature, majority ripe *Thaumantias maculata*, a few ripe	*Lesueuria vitrea*, in swarms, a few small, largest 2 inches in diameter *Pleurobrachia*, in swarms, large and small
13th July 1888. 1 mile N. of Pier 2.45 p.m.	To within 200 yards of Pier head 3 fathoms	5 fathoms Sandy		¾ hour 3.30 p.m.	Eggs of top-knot	2 gobies, 7 mm. and 12 mm.	*Thaumantias hemisphærica*, many large, *Sarsia tubulosa*, very few 1 *Margelis ramosa* (*Bougainvillia britannica*), large, immature	1 *Aurelia aurita*, 4 inches in diameter *Lesueuria vitrea*, numerous (as before) *Pleurobrachia* (as before)
14th July 1888. ¼ mile N. of Kinkell Ness 2.20 p.m.	To within ¾ mile abreast of Maiden Rock 3 fathoms	5¼ fathoms rocky		¾ hour 3·5 p.m.			*Thaumantias hemisphærica*, numerous *Sarsia tubulosa*, a few A few ova	3 *Aurelia aurita*, 4 inches in diameter *Lesueuria vitrea*, a few *Pleurobrachia*, numerous, Larval *Peachia*, many
	2 feet from bottom	5¼ fathoms rocky					*Thaumantias hemisphærica*, many	*Pleurobrachia*, small, very few, and a few embryonic forms Larval *Peachia* (?)

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
				Ampelisca gaimardii ♀ bearing ova			3 kinds	A few Cœlenterate (?) Ova ·004 to ·005 inch *Tintinnus denticulatus*
			A very few Zoeæ	1 *Hyperia medusarum* *Caligus*, very few Moultings of Cirripedes	*Appendicularia*, a few very small		3 kinds	
	Bottom	**Tow-net.**						
		As before Young forms in tube (*Spio*-like)	*Nauplii*, numerous	1 *Hippolyte* $\frac{1}{18}$ inch *Acartia longiremis* *Halitemora longicornis*, myriad, and many *Longipedia coronata* Ostracoda, many *Evadne*, numerous A few ova in *Morula*-stage	*Cyphonautes*	*Post-larval Spiralis*, a few *Natica*, and other univalves, myriad Mussels, ·011 inch to ·014 inch, numerous	3 kinds	*Tintinnus denticulatus*, numerous Form (see sketch) Richest collection this summer

Net put down, where and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	[illegible]			
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
18th July 1888. 500 yards E. of Pier head 9 a.m	W. 2 feet from bottom	6 fathoms Sandy	*Appendicularia*, very few, small *Acartia longiremis*, very few *Caligus*, very few Larval *Nerine* *Pleurobrachia*, very few large 6 *Beroë*, large and small *Laodice cruciata*, large, mature *Obelia dichotoma* *Ceratium divergens*	½ hour 9.30 a.m.	Montagu's sucker Sand-eel Eggs of rockling, gurnard, sprat, and solenette.		*Obelia dichotoma*	*Pleurobrachia*, many Larval *Pleurobrachia* ova
19th July 1888. ¾ mile N.E. of Kinkell Ness and 1 mile E. of Pier head 10.30 a.m.	W. 4 fathoms.	7 fathoms Sandy	*Acartia longiremis*, very few *Centropages hamatus* *Halitemora longicornis* *Evadne nordmanni*, very few *Nauplii*, a few Larval Annelid (see sketch) *Plutei*, very few 1 *Pleurobrachia*, medium size *Pleurobrachia*, very few, small Larval *Pleurobrachia*	1 hour 11.30 a.m.	Eggs of solenette, gurnard and lemon dab (?)	—	*Laodice cruciata* (*Thaumantias pilosella*), numerous, large, ripe *Thaumantias hemisphærica*, a few	*Aurelia aurita*, *Lesueuria*, many *Beroë*, numerous *Pleurobrachia*, myriad, large and small
	2 feet from bottom	7 fathoms						

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Bottom	**Tow-net.**						
Plutei, numerous		*Nerine*, many (as before) *Spio*-like in tube *Capitella*	*Nauplii*, numerous Zoeæ, very few	*Acartia longiremis*, myriad *Halitemora longicornis*, a few *Centropages hamatus* *Longipedia coronata* *Pleopis polyphemoides* *Oithona spinifrons*, a few *Evadne*, many Ostracoda, very few	*Appendicularia*, very few, small *Cyphonautes*, very few *Phoronis*, and other forms	Veliger of *Spirialis* (?) *Post-larval* Mussels ·011 inch to ·013 inch A few ova	4 kinds	*Tintinnus denticulatus* *Ceratium divergens* ,, *tripos*, numerous, ,, *fusus*, numerous, Algoid as formerly
							Rhizosolenia very few (see sketch) 3 other kinds in surface net	
	Bottom	**Tow-net.**						
Plutei, many		*Terebella* *Polynoë*, *Spio*	*Nauplii*, a few	*Halitemora longicornis*, and *Acartia longiremis*, a few *Evadne*, very few *Cyclopina littoralis*	*Cyphonautes*	Veliger of *Spirialis* (?) *Post-Larval* mussels ·013 inch *Spirialis*, and other univalves	7 kinds	*Tintinnus denticulatus* *Ceratium fusus*

Net put down, where, and time	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size,	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
20th July 1888. 1 mile E. of Pier head, and 1 mile N.E. of Kinkell Ness	W. 4 fathoms	7 fathoms Sandy	Young Mollusca, ·0125 inch *Acartia longiremis*, very few *Calanus finmarchicus* *Centropages hamatus* Larval Annelid, with enormous bristles (*Sabellaria*)		1 *Cyclopterus lumpus*, newly hatched	3 gadoids *Gadus virens*, 19 mm., and 1 *Gadus minutus*, 15 mm.	*Thaumantias melanops*, myriad Numerous planulæ	*Aurelia aurita*, many, 6 inches in diameter *Lesueuria* *Pleurobrachia*, numerous Larval *Peachia*, ¼ to ⅝ inch, clinging to *Thaumantias melanops*, numerous
	2 feet from bottom	7 fathoms					*Obelia dichotoma*, very few Ova	*Pleurobrachia*, a few medium size *Pleurobrachia* (larval)
21st July 1887. 'Garland' 12.20 p.m.			Young Hyperiæ *Calanus finmarchicus* *Acartia longiremis* Minute siphonophore-like					
21st July 1888.			*Acartia longiremis* *Centropages hamatus* *Anomalocera patersonii* *Oithona spinifrons*					

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
Plutei, very few		*Nerine* Form with enormous bristles (*Sabellaria*) *Terebella* *Polynoë*	*Nauplii*, numerous	*Thysanoessa tenera* Surface and bottom nets *Longipedia coronata*, many *Acartia longiremis*, numerous *Halitemora longicornis*, numerous *Oithona spinifrons*, a few *Pleopsis polyphemoides* Ostracoda, a few *Evadne nordmanni*, a few	*Cyphonautes*, very few	*Post-larval* Univalves, very few Mussels, ·013 inches, ·0145 inch, and other forms	8 kinds and *Rhizosolenia*, very few	*Tintinnus denticulatus*, many Algoid (as before)
	Some 15 mm.		Lobster-like	*Hyperia medusarum*, ♀ with ova *Calanus finmarchicus* *Acartia longiremis* *Pseudocalanus elongatus*				

Net put down, where and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
23rd July 1888. Between Kinkell Ness and Maiden Rock ¾ mile from shore and ¾ mile from Pier head 11.10 a.m.	Towards Castle 3½ fathoms	5½ fathoms Sandy	22nd July 1887, 'Garland,' surface-net vii *Anomalocera patersonii* *Halitemora longicornis*, a few *Acartia longiremis*, a few *Longipedia coronata* *Evadne nordmanni*, a few *Plutei* *Ceratium fusus* and *tripos*, very few 'Garland,' surface-net viii *Calanus finmarchicus*	⅔ hour 11.50 a.m.	Many eggs of gurnard Many eggs of sprat Many eggs of rockling A few of dragonet	Pleuronectids, 5·2 mm. Gobies 4 to 5·2 mm. Rockling, 3·8 mm. Pipe-fishes 16 to 22 mm.	*Sarsia tubulosa*, a few *Thaumantias* (?) myriad *Thaumantias hemisphærica*, very few	*Lesueuria*, a few *Beroë*, many *Pleurobrachia*, many, Larval *Peachia*, on *Thaumantias*
	2 feet from bottom	5½ fathoms					*Obelia dichotoma*, very few Ova	*Pleurobrachia*, a few small
24th July 1888. ¾ mile N.E. of Pier 11.10 a.m.	Towards Eden 3½ fathoms	5 to 4½ fathoms Sandy	Mussels, ·015 inch, very few *Acartia longiremis*, a few *Evadne nordmanni*, a few *Nauplii*, very few *Plutei*, many *Tintinnus denticulatus*, very few	⅔ hour 11.50 a.m.			*Thaumantias (?)* numerous 1 *Margelis ramosa* (*Bougainvillia britannica*), ripe *Sarsia tubulosa*, a few *Thaumantias hemisphærica*, a few	*Lesueuria*, numerous *Beroë*, numerous, *Pleurobrachia*, myriad Larval *Peachia*, a few
	2 feet from bottom	5 to 4½ fathoms					*Obelia dichotoma*, very few Ova	*Pleurobrachia*, a few small Larval *Pleurobrachia*, a few

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
				Hyperia medusarum, ♀ bearing ova 1 *Lestrigonus, Kinahani*, ♂ (?)	*Appendicularia*, small		3 kinds in surface net	
	Bottom	**Tow-net.**						
Plutei, a few		*Nerine*, many Form with large bristles as before (*Sabellaria*) *Terebella* *Polynoë*	Zoeæ, very few *Nauplii*, many	1 *Diastylis rathkii* *Halitemora longicornis* *Acartia longiremis* *Oithona spinifrons*	*Appendicularia*, very few *Cyphonautes*, many	*Post-larval Natica*, and other univalves, many Mussels and other bivalves ·013 inch and ·0155 inch Young univalve *Natica catena* (?), very few	6 kinds	*Tintinnus denticulatus* and *Ceratium tripos*
	Bottom	**Tow-net.**						
Plutei, many Bipinnaria Brachiolaria		*Nerine*, a few *Polynoë*, very few Form with enormous bristles (*Sabellaria*), a few	*Nauplii*, many	*Acartia longiremis* *Longipedia coronata* and *Oithona spinifrons*, numerous Ostracoda, a few *Evadne nordmanni*, a few Exuviæ of *Balani*	*Appendicularia*, small, very few *Cyphonautes*, a few	*Post - larval* univalves, *Natica*, etc., a few Mussels ·014 inch to ·013 inch Young univalve *Natica catena* (?)	*Rhizosolenia*, very few, and 5 other kinds	*Tintinnus denticulatus* *Ceratium fusus* ,, *tripos*, very few Many minute ova

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-Net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
25th July 1888. 3 miles from St Andrews 2 miles N. of Whale Rock 12.55 p.m.	Towards St Andrews 5 fathoms	9 fathoms Sandy	*Natica catena (?)*, ·013 inch, very few *Evadne nordmanni*, numerous *Acartia longiremis*, many *Halitemora longicornis* *Centropages hamatus* Larval Annelid (young of *Polynoë*) *Plutei*, myriad *Pleurobrachia*, a few, small	1½ hour 1.50 p.m.			*Thaumantias melanops*, myriad *Thaumantias* (?), a few *Margelis ramosa (Bougainvillia britannica)*, a few ripe *Thaumantias hemisphærica*, many	*Lesueuria*, myriad, *Beroë*, myriad *Pleurobrachia*, myriad Larval *Peachia*, many, clinging to *Thaumantias melanops*
	2 feet from bottom	9 fathoms					*Thaumantias melanops*, small, unripe 2 *Thaumantias hemisphærica* *Obelia dichotoma*, a few *Stauridium productum*, very few	*Pleurobrachia*, very few, small
26th July 1888. 1 mile N. of Pier	Towards Baths 3 fathoms	5 fathoms Sandy		½ hour 1.30 p.m	Eggs of rockling, sprat, weever and gurnard	12 gobies, 7 mm. to 13 mm., smallest with permanent rays in caudal region	*Thaumantias hemisphærica*, many	*Lesueuria*, a few *Beroë*, many *Pleurobrachia*, large, myriad
1 mile N.E of Pier head 2 p.m.	Towards Pier 2 feet from bottom	6 to 4½ fathoms Sandy	*Appendicularia*, small, very few *Natica catena (?)*, very few Mussels ·013 inch, many *Longipedia coronata*, very few *Evadne nordmanni*, Lovén, numerous Larval Annelid (*Wartelia*) in tube, very few *Plutei*, a few *Pleurobrachia*, young, very few A few Cœlenterate ova *Ceratium fusus*, very few				*Obelia dichotoma*, very few *Podocoryne carnea (?)*	*Pleurobrachia*, a few, small

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
				2 Amphipods, *Hyperia galba*, small			4 kinds	
	Bottom	**Tow-net.**						
Plutei, many		*Terebella*, *Lagis*, *Polynoë* and *Nerine*, myriad Form with enormous bristles (*Sabellaria*), and 2 other forms, many *Aricia* and *Pholoë*, *Polygordius*	*Nauplii*, numerous	*Halitemora longicornis*, *Acartia longiremis* and *Oithona spinifrons*, many *Longipedia coronata*, a few, Ostracoda many, *Evadne*, many	*Cyphonautes*, a few larger than before	*Post-larval Natica catena (?)*, many, and other univalves Mussels, ·014 inch, numerous Young *Natica catena (?)* as before	*Rhizosolenia*, very few, and 6 other kinds	*Tintinnus denticulatus*, *Ceratium fusus* and *tripos* Algoid form (see sketch)
	Bottom	**Tow-net.**						
Bipinnaria, *Auricularia*		*Lagis* Form with enormous bristles (*Sabellaria*), very few *Polynoe*, very few *Spio*, *Eulalia*, *Nicolea*, *Aricia*	Zoeæ, very few *Nauplii*, many	*Halitemora longicornis*, *Acartia longiremis* and *Longipedia coronata*, numerous Ostracoda, a few, *Evadne nordmanni*, numerous	*Appendicularia*, very few, small *Cyphonautes*, numerous	*Post-larval Natica* and other univalves, numerous, Mussels, ·015 inch, and other bivalves, numerous Young *Natica* as before	*Rhizosolenia*, very few, and 8 other kinds	Infusoria :— *Tintinnus denticulatus* *Ceratium fusus*, many *Ceratium tripos*, a few Forms in both nets as in yesterday's bottom tow-net

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
31st July 1888. 1 mile N. of Pier 9 a.m.	E. towards Redhead, 2 feet from bottom surface net 9 feet from surface	5½ fathoms Sandy	*Appendicularïæ*, young, very few *Cyphonautes*, many *Natica catena (?)*, young, very few Mussels, ·013 inch, ·015 inch, and other bivalves *Halitemora longicornis* *Acartia longiremis* *Longipedia coronata*, very few *Oithona spinifrons*, very few Ostracoda, very few *Evadne nordmanni*, many *Nauplii*, many *Plutei*, a few *Beroë*, many *Pleurobrachia*, young, a few		Eggs of Solenette Larval sand-eels, a few	Dragonet, 4 mm. Motella, 4–5 mm., several Gobies, 6–11 mm. many Sand-eels, 7–12 mm.		*Pleurobrachia*, very few *Pleurobrachia*, young, very few
1 August 1888. 1¾ mile N.E. off Pier opposite Eden 10.20 a.m.	Towards Castle 3½ fathoms	7 fathoms Sandy	*Appendicularïæ* (larval), a few *Cyphonautes*, a few *Natica catena* (?), a few Copepoda, a few *Evadne nordmanni*, a few *Plutei*, a few *Beroë*, very few	$\frac{5}{12}$ hour 10.45 a.m.		Cupeoids, 16–18 mm. several	*Thaumantias melanops*, many *Thaumantias hemisphærica*, a few	*Beroë*, various sizes, average 1½ inch *Pleurobrachia*, ⅛ inch and upwards, many
7th August 1888. Off Boarhills Harbour 5 50 p.m.	E. 7½ fathoms	9½ fathoms Sandy	*Cyphonautes*, many *Actinotrocha* *Spirialis*, numerous *Acartia longiremis* *Halitemora longicornis* Megalops of *Portunus* Zoeæ of *Porcellana*, many Zoeæ of *Portunus* (?) *Wartelia* in transparent tubes *Tomopteris*, many *Sagittæ*, many *Plutei*, many *Beroë*, a few, medium size *Pleurobrachia*, numerous, small *Thaumantias inconspicua* *Thaumantias octona* *Lizzia octopunctata*, $\frac{1}{16}$ inch, and many small Medusa buds	$\frac{11}{12}$ hour 6.45 p.m. (Surface) ¾ hour 6.35 p.m.		Gunnel, 43 mm.	1 *Margelis ramosa* (*Bougainvillia britannica*) *Thaumantias hemisphærica* and *inconspicua*	*Lesueuria*, a few *Beroë*, 1½ to 4 inches *Pleurobrachia*, numerous, ⅛ inch to 1½ inches Larval *Peachia*, chiefly attached to *Thaumantias hemisphærica*

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Bottom	**Tow-net.**						
Plutei, many, few young star-fishes		Form in tube, many *Nerine*, many *Polygordius*	*Nauplii*, many	*Diastylis rathkii*, a few *Acartia longiremis*, *Oithona spinifrons*, and *Longipedia coronata*, numerous *Halitemora longicornis*, a few *Pleopsis polyphemoides* *Cyclopina littoralis*, *Pseudocalanus elongatus* Ostracoda, many *Evadne nordmanni*, Lovén, numerous	*Appendicularia*, young, many *Cyphonautes*, numerous	*Post-larval* mussels, ·013 inch and ·023 inch, and other bivalves *Natica*, as before	*Rhizosolenia* very few, and 9 or 10 other kinds in both nets	*Tintinnus denticulatus* *Ceratium tripos*, *fusus*, and *divergens* *Amphidinium operculatum* Algoid structure (as before) in nets
						Gastropods, in veliger stage	Many in surface net	
	Bottom	**Tow-net.**						
Plutei, many, 2 kinds		*Polygordius*		Copepoda, *Evadne nordmanni*, numerous	*Cyphonautes*, many	*Post-larval* mussels ·014 inch	Many	*Ceratium tripos*, a few
			Zoeæ	Young *Nephrops* *Caligus* ♂ and ♀ a few, other Copepoda, a few				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ]
							2 *Thaumantias hemisphærica*, *globosa*, and *inconspicua* *Oceania turrita*	*Beroë*, numerous *Pleurobrachia*, many
8th August 1888. Fife Ness, S. by W. Bell Rock, E. by N. ½ N. 2 miles from Bell Rock, E. 12.45 p.m. (mid-water and surface nets) 3.30 p.m. 3.35 p.m. (surface net) 12.40 p.m. 3.35 p.m. (bottom nets)	N.E. 16½ fathoms (surface) 1 fathom (bottom) 8 to 9 fathoms	18 fathoms Rocky	*Appendicularia*, a few *Natica catena* (?) Mussels, ·011 inch to ·014 inch *Acartia longiremis*, *Centropages hamatus* *Nerine*, a few *Plutei*, many Larval *Peachia*, a few *Pleurobrachia*, a few *Ceratium fusus* *Ceratium furca*	1 hour 1.45 p.m. (also surface net) 1 hour 4.30 p.m. 1½ hour (surface net) 4.30 p.m. 1⅙ hour 1.50 p.m. 1½ hour 4.30 p.m. (bottom nets)		1 Montagu's sucker	*Thaumantias hemisphærica*, *inconspicua*, *globosa*, and *melanops* *Oceania turrita*	Larval *Peachia* *Beroë* *Pleurobrachia* *Thaumantias hemisphærica*
							Thaumantias melanops, *globosa*, and *inconspicua* *Margelis ramosa* (*Bougainvilia britannica*)	*Pleurobrachia*, many
8th August 1888. 1½ mile from Bell Rock St Andrews W. by N. Bell Rock N.E. by N., 2.10 p.m. (mid-water net) 2.15 p.m. (surface net) 2.10 p.m. (bottom net)	E.S.E. 18½ fathoms 9 fathoms	20 fathoms Rocky	Ovum of *Motella* *Appendicularia*, a few small *Spirialis*, a few Mussels young, and other bivalves *Acartia longiremis* *Polynoë pellucida*, about 1 mm. Larval *Nerine*, a few Minute brittle stars *Plutei*, many *Thaumantias inconspicua*, *hemisphærica*, and *globosa* *Ceratium fusus* Radiolarian with long spines	¾ hour 2.55 p.m. ¾ hour 2.50 p.m. (surface net) ⅔ hour 2.50 p.m. (bottom net)		1 *Cottus quadricornis* (?), 7 mm., 1 Montagu's sucker, 6 mm. 3 Pleuronectids, 6 mm., 7 mm., 10 mm.	*Thaumantias hemisphærica*, *melanops*, and *inconspicua*	*Beroë* *Pleurobrachia*, Larval *Peachia*, a few
							Thaumantias hemisphærica, and *inconspicua*	*Beroë*, a few *Pleurobrachia*, many

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
				Acartia longiremis, *Calanus finmarchicus*, *Centropages hamatus* *Evadne nordmanni*	*Appendicularia*	*Spirialis*		
			Zoeæ		*Appendicularia*, a few			
	Bottom	**Tow-net.**						
Plutei, many	Many	*Magelona*, young, a few *Castalia*, young	Zoeæ of *Portunus* (?), lobster-like	*Acartia longiremis*, *Centropages hamatus*, and *typicus*				
Plutei, many			Zoeæ *Nauplii*	Copepoda Ostracoda, a few				
	Bottom	**Tow-net.**						
	A few	*Polynoë*, young, ⅛ inch *Terebella* (?), young, older than inshore forms	Zoeæ, many	*Centropages hamatus*, many Ostracoda, a few *Evadne*, a few	*Appendicularia*, a few, young *Actinotrocha*, small	*Post-larval Spirialis*, a few, older than inshore forms		*Ceratium tripos*

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
9th August 1888. (1) 15 miles E.S.E. of Bell Rock	24 fathoms 2 fathoms (surface net)	28 fathoms	3 *Motella*, 3·5 mm. 5 mm. and 6 mm. *Appendicularia*, small *Centropages hamatus*, many Megalops, very few Zoeæ, many *Evadne nordmanni*, very few *Plutei*, a few Peculiar form (Foraminifer?)		Eggs of gurnard, rockling and sprat	2 *Gadus merlangus*, 16 mm. and 29 mm.	*Tima bairdii* A very few small Medusa buds *Sertularia abietina* (?) Hydroid stock with Polyzoon growing on it	
9th August 1888. (2) Bell Rock Trawling Ground Bell Rock bearing N.W. and Isle of May. N.W.		30 fathoms	4 larval Pleuronectids A few eggs, ·05 inch to ·053 inch *Appendicularia*, Zoeæ, many *Acartia longiremis* *Centropages hamatus* Megalops *Plutei*, a few A very few small Medusæ buds		1 Pleuronectid, 6·5 mm.	1 *Callionymus*, about 4 mm. 3 flounders, 10 mm. 1 goby, 5 mm.	Hydroid stock of *Obelia* *Lizzia octopunctata* *Lizzia blondina*	*Euphysa aurata* *Pleurobrachia*, less than ⅛ inch

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
Plutei	A very few		Megalops	Young *Pandalus* (?) *Centropages hamatus*, *Anomalocera patersonii* *Caligus* ♀, with parasitic *Udonella caligorum*				
	Bottom	**Tow-net.**						
Plutei, very few Young starfishes, a few	A few	*Nerine* Form with numerous bristles (*Sabellaria*) Form (see sketch B)	Zoeæ, numerous	*Calanus finmarchicus*, a few *Halitemora longicornis*, many *Mysis* (?) *Evadne nordmanni*	*Appendicularia*, many *Cyphonautes*	Univalve, small Bivalves, very few, small		
	Bottom	**Tow-net.**						
Plutei, a few *Post-larval* 2 Echini and small sand and brittle stars	Numerous, large and small	*Polynoë* *Nerine*	*Post-larval Pandalus annulicornis*(?)	*Schistomysis ornata*, very few *Halitemora longicornis*, many *Pseudocalanus elongatus*, few *Anomalocera patersonii* *Centropages hamatus* *Calanus finmarchicus*	*Appendicularia*, in swarms *Actinotrocha*	*Spirialis*, a few 1 bivalve form and relics of univalves		
	Trawl-net	**(in Bag of**	**Tow-net**	**in Trawl.)**				
Young sand stars	Many	A few (see sketch B)	Zoeæ, few Megalops, a few	*Mysis flexuosa*, many *Gammarus Campylops* (?) very few *Anonyx edwardsi*, very few *Halitemora longicornis*				Numerous fish scales

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature; Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
10th August 1888. (2) S.E. of Isle of May 15 miles	24 fathoms	28 fathoms	(1) *Appendiculariæ*, very few *Calanus finmarchicus*, many *Halitemora longicornis* *Centropages hamatus* (Lilljeborg) *Pseudocalanus elongatus* *Sagittæ*, many *Plutei*, numerous *Obelia gelatinosa* (Hydroid stock) A few small Medusa buds		Eggs of gurnard and rockling			
						Gurnards 2 other forms	Small Medusa buds	
Over same ground, W. by N.		28 to 30 fathoms				1 Pleuronectid (Plaice), 13·5 mm. Permanent rays in fins 1 goby (*G. minutus*), 13 mm.	*Sertularia*, very few A few other Hydroid stocks	
(3) Over same ground			(2) *Centropages hamatus*, a few *Calanus finmarchicus* very few *Plutei*, many		Eggs of sole and rockling 1 *Cyclopterus lumpus*, 6 mm.	1 *Gadus merlangus*, 1½ inch, with 4 parasitic *Caligi*		
					Eggs of rockling			

Mid-water-Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc
Adult 4 *Ophiocoma nigra*		1 adult		1 *Hyas coarctatus* 1 *Crangon vulgaris*, ♀ bearing ova 2 *Phoxichilidium* 1 *Pycnogonum littorale*	1 Ascidian			
	Bottom	**Tow-net I.**						
Plutei many	A few	*Nerine*		*Calanus finmarchicus*, Günner, numerous *Centropages typicus*, a few				Radiolarians, a few
	Ground	**Trawl II.**						
	Swarms, 17 mm. (average size)	A few Form with circumoral ring of tentacles (see sketch)	Megalops, very few	*Mysis vulgaris*, in swarms *Schistomysis ornata*, many *Pandalus annulicornis* (?), young *Arcturus gracilis*		Univalve forms, a few Mussels, a few, 4 mm. 2 Cephalopods (Young *Sepiola*), 5 mm,		
Ophiuroids and *Ophiothrix* Echini, young	Myriad	*Polynoë*, young, a very few *Nerine*, small *Wartelia*, young in tube		1 *Crangon vulgaris*, large *Schistomysis ornata*, many, small *Mysis vulgaris*, very few, small *Boreophausia raschii*, Young crabs, ⅛ inch, very few		*Spirialis*, a few, and relics of other Mollusks.		
	Bottom	**Tow-net**	**II.**					
Young *Spatangus* *Ophiuroids*, and brittle stars		*Terebella*, very young	Megalops, very few	Remains of Schizopods, *Centropages hamatus*, many *Calanus finmarchicus*, a few			Many kinds	*Ceratium tripos*, many *Ceratium furca*, very few Radiolarian (as before), very few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
11th August 1888. West of Isle of May		15 feet				2 gurnards, 8 mm., permanent rays in tail	1 *Thaumantias hemisphœrica* 1 *Tiara* (*Oceania*) *octona* 1 *Margelis ramosa* (*Bougainvillia britannica*) 1 *Thaumantias* (*Bougainvillia*) *nigritella* *Lizzia octopunctata* *Lizzia minuta*	
2nd August 1888. ½ mile from shore, opposite middle of W. Sands 10 a.m.	E. 2½ fathoms	4 fathoms Sandy	*Appendicularicæ* *Actinotrocha* and *Tornaria*, many *Cyphonautes*, many Mussels (minute) *Centropages hamatus* *Acartia longiremis* *Cyclops* (?) Zoeæ *Evadne nordmanni* *Echinus*, minute, many *Plutei*, three kinds *Avicularia*, with spines	½ hour 10.20 a.m.	Eggs of gurnard, sprat and rockling	Clupeoids, 5·5 to 8 mm.	*Thaumantias*, (*inconspicua?*) very few, *Thaumantias hemisphœrica*, and *melanops*	*Beroë*, many *Pleurobrachia*, small

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
Plutei, many Echini, very young		*Nerine*, numerous *Tomopteris*, ⅛ inch, very small form in tube (*Wartelia*)	Zoeæ, very few	*Pandalus annulicornis*, young *Centropages hamatus* (Lilljeborg), many *Calanus finmarchicus*, many *Acartia longicornis* (Lilljeborg) *Halitemora longicornis*, Müller			Very few	
					Appendicularia, many		Many in surface net	
	Bottom	**Tow-net.**						
Plutei, two forms		*Nerine*, a few *Polydora*, etc. Adult *Nereis*, a few		Copepods (2 kinds)	*Appendicularia*, many	*Post-larval* univalves, a few Mussels, ·012 inch	4 kinds, abundant	*Ceratium furca* „ *fusus*, many „ *tripos* Radiolarian

Net put down, where and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ	Medusæ.
3rd August 1888. Midway between Pier and Rock and Spindle, one mile from shore 9.15 a.m.	N.W. 3½ fathoms	6½ to 4 fathoms Sandy	*Appendicularicæ*, many *Natica* (?), a few Mussels, ·01 inch to ·015 inch Ostracoda, many *Evadne*, many Zoeæ *Nereis* (larval) *Plutei* *Ceratium fusus* ,, *tripos*	½ hour 9.45 a.m.			*Thaumantias sarnica* (?), *globosa*, *inconspicua*, *melanops*, *Oceania globulosa* (?)	*Aurelia aurita*, ♂, 8 inches in diameter *Lesueuria*, a few, 1 inch to 1½ inches *Beroë*, a few, ¼ inch to 3¼ inches *Pleurobrachia*, very small, 4 mm. to 19 mm.
						Gobies,[1] 3·8 to 14 mm. Pleuronectids, 4·5 to 8 mm.	*Thaumantias*, *inconspicua*	
4th August 1888. Off mouth of River Eden (south side) 9 a.m.	N. 2 fathoms	3½ fathoms Sandy	Mussels, ·01 inch to ·013 inch *Evadne*, many *Ophiuroid* (larval) *Plutei*, many *Ceratium fusus*	½ hour 9.30 a.m.	Eggs of gurnard, sprat and rockling	15 gobies, 3·5 mm. to 10 mm. Flounder, 10 mm.	*Thaumantias inconspicua*, *globosa*, *conversa*, *melanops*, var. *sarnica*	*Lesueuria*, a few, ½ inch to 3½ inches *Beroë*, many, 1 to 3 inches *Pleurobrachia*, many, 3 mm. to 8 mm. Larval *Peachia*
							Thaumantias melanops, *hemisphærica*	
14th August 1888. ½ mile N.E. of Pier	N.E.	5½ fathoms Sandy	*Appendicularicæ*, a few *Cyphonautes*, a few *Natica catena* (?), and other univalves, many Mussels, ·01 inch to ·013 inch *Acartia longiremis* *Centropages hamatus* Ostracoda *Plutei*, a few *Avicularia* *Pleurobrachia*, a few, ⅛ inch to ½ inch A few Medusa buds *Ceratium fusus* ,, *tripos* Radiolarians, a few					*Pleurobrachia*, ⅛ inch to ½ inch, a few

Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Mid-water Net.								
			Nephrops (Zoea-stage)	*Caligus*	*Appendicularia*, a few, small		A few in both nets	
	Bottom	**Tow-net.**						
Plutei, many		*Nerine*, many *Polydora*, etc		*Evadne nordmanni*, many	*Appendicularia*, many	*Post-larval* mussels, many	Many forms	*Ceratium fusus* ,, *furca* ,, *tripos*
	1, 12 mm	*Polygordius*, Adult *Tomopteris*, a few		*Schistomysis ornata* *Caligus*	*Appendicularia*, a few		Many in surface net	
	Bottom	**Tow-net.**						
		Nerine, a few *Polydora*, etc. Adult *Nereis*, many		*Evadne nordmanni*	*Appendicularia*, many *Actinotrocha*	*Post-larval* mussels, very abundant	Very abundant	*Ceratium tripos*
	Bottom	**Tow-net.**						
Plutei, many Young starfishes, a few		*Nerine*, a few *Polydora*, etc. *Terebella*		*Centropages typicus*, *Acartia longiremis* Ostracoda	*Appendicularia*, a few *Actinotrocha*, 2	*Natica* and other univalves, many Mussels (as above), numerous	Many different forms	*Ceratium tripos*

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
17th August 1888. 1 mile N.E. of Pier head 11.45 a.m.		5 to 8 fathoms Sandy	*Cyphonautes*, very few *Natica catena* (?), young Mussels, ·014 inch, many *Acartia longiremis*, numerous *Centropages hamatus*, numerous *Halitemora longicornis*, numerous Ostracoda, many *Nauplii*, a few Larval form (see sketch, 25th July) of Annelid Larval Annelid, with enormous bristles (*Nerine*) *Plutei*, many *Pleurobrachia*, many, small Cœlenterate ova, a few *Ceratium tripos*, very few	¾ hour 12.30 p.m.		Montagu's sucker, 4 mm. Dragonet, 5·5 mm. Gobies, 4 to 9 mm. Sand-eels, 5 mm.	*Obelia dichotoma*, a few Ova, many	*Pleurobrachia*, many, small Young forms of *Pleurobrachia*, a few
20th August 1888. ½ mile N. of Whale Rock 11.15 a.m.	E. 4½ fathoms	9 fathoms Sandy	*Appendicularia*, very few *Cyphonautes*, a very few *Natica catena* (?) a few, young Young mussels, ·011 inch to ·014 inch; other young bivalves *Acartia longiremis*, many *Halitemora longicornis*, many *Centropages hamatus*, a few *Longipedia coronata*, a few Ostracoda, very few *Nauplii*, a few 2 larval Annelids (see sketch, 25th July) Larval *Nereis*, very few Nematodes, very small, a few Turbellarian, very few (see sketch) *Plutei*, very few *Pleurobrachia*, many *Thaumantias hemisphærica*, very few, mature A few Cœlenterate ova Radiolarian (as before)	$_3$ hour 11.35 p.m.		Adult 7 *Gadus merlangus*, 3 inches	*Thaumantias hemisphærica*, numerous, mature	Very small fragment of Medusa 1 *Beroë*, mature *Pleurobrachia*, myriad

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Bottom	**Tow-net.**						
Young starfishes, many *Plutei*, many		*Polynoë*, very few *Nerine*, very few *Spio* *Polydora* *Capitella*, etc. Nematode	Zoeæ of *Porcellana*, long-spined, myriad *Nauplii*, a few	*Diastylis rathkii*, very few *Acartia longiremis*, *Oithona spinifrons* *Longipedia coronata*, numerous *Pseudocalanus elongatus* *Centropages hamatus* *Cyclopina*	*Appendicularia*, very few *Cyphonautes*, a few	*Post-larval Natica* (?) and other univalves Mussels, ·013 inch to ·017 inch	*Rhizosolenia*, and 6 other forms	*Ceratium fusus*, a few *Ceratium tripos*, a few *Ceratium divergens*, very few
							Rhizosolenia, and 5 other kinds; many in surface-net	Radiolarian in surface net

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
21st August 1888. ¼ mile E. of Maiden Rock 11.45 a.m.	Towards Pier	5 fathoms Rocky	*Appendiculariæ*, a few *Cyphonautes*, many *Spirialis*, a few *Natica catena* (?), many Mussels, ·014 inch, many *Acartia longiremis*, many *Halitemora longicornis*, many *Longipedia coronata*, many *Centropages hamatus* Ostracoda, numerous *Evadne*, very few Exuviæ of *Balani* *Nauplii*, a few *Magelona, papillicornis*, young, not quite ⅛ inch Larval *Nerine*, a few, and other larval Annelids(see sketch) *Plutei*, very few *Tintinnus denticulatus*, very few	$\frac{7}{12}$ hour 12.20 p.m.		4 gobies, 3·2 mm. to 4·4 mm., smallest with permanent rays appearing in tail	A few planulæ	*Pleurobrachia*, a few small A few ova of *Pleurobrachia*,
22nd August 1888. Near Eden mouth ¾ mile from shore, 1¾ mile from Pier 11.55 a.m.	N. 3½ fathoms	4 fathoms Sandy	*Appendicularię*, very few *Cyphonautes*, very few *Natica catena* (?), very few Mussels ·011 to 013 inch, very few *Acartia longiremis*, many *Centropages hamatus* Ostracoda, very few *Plutei*, very few Small Medusa bud *Tintinnus denticulatus* *Ceratium divergens*, very few	¾ hour 12.40 p.m.		9 gobies, 5 to 12 mm. Pleuronectid (see sketch) 3 *Syngnathus acus*, 1½ inch	*Oceania octona* (?) *Oceania* (?) *Thaumantias sarnica*, a few small 3 *Thaumantias* (see sketch, 24th July)	*Beroë*, very few *Pleurobrachia*, a few Ova of *Pleurobrachia*, a few

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
		Form with numerous bristles (*Sabellaria*), a few *Nerine*, a few Other forms, a few *Terebella* *Polydora* *Spio* Young *Magelona*	*Nauplii*, a few	*Acartia longiremis*, numerous *Halitemora longicornis*, a few	*Appendicularia*, very few	*Post-larval* Univalves, a few Mussels, ·011 inch, a few	*Rhizosolenia* numerous, 7 other kinds	*Ceratium tripos*, *Tintinnus denticulatus*, a few Radiolarian, as before
	Bottom	**Tow-net.**						
		Terebella *Polydora*, etc.	*Nauplii*, a few	*Cuma bispinosa* (?), young *Acartia longiremis*, numerous *Halitemora longicornis*, many *Oithona spinifrons*, a few *Thalestris longimana*, 1 specimen Ostracoda, a few	*Appendicularia*, many *Cyphonautes*, very few	*Post-larval Natica*, and other univalves, many Mussels. ·013 inch to ·014 inch	*Rhizosolenia*, numerous in both nets, and many other kinds	*Ceratium tripos* ,, *fusus* ,, *divergens* *Tintinnus denticulatus* Radiolarian, as before
		Polynoë, very few	Megalops	*Liljeborgia shetlandica* *Schistomysis ornata* 1 crab, ·06 inch *Centropages typicus*, a few *Halitemora longicornis*, *Caligus*, very few			*Rhizosolenia*, very few numerous in surface-net, with many other kinds	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
27th August 1888. (1) 200 yards N. off Pier head 7.40 a.m.	N.E. towards targets 3 fathoms	5 to 7 fathoms Rocky, sandy	*Cyphonautes*, very few Young mussels, ·017 inch, very few *Halitemora longicornis*, very few *Acartia longiremis*, very few Larval Annelid (*Sabellaria*), with enormous bristles (as before) *Pleurobrachia*, numerous *Thaumantias hemisphœrica*, very few *Tintinnus denticulatus*, very few	⅚ hour 8.30 p.m.			*Thaumantias hemisphœrica*, *Thaumantias quadrata*, many *Thaumantias* (?) as before *Laodice cruciata* (*Thaumantias pilosella*) 2 *Tiara* (*Oceania*) *octona*	*Pleurobrachia*, numerous
(2) 100 yards S.E. of Beacon 3.30 p.m.	Around Beacon	Rocky	*Appendicularia*, very few Univalves, very few *Acartia longiremis*, very few Zoeæ, very few *Nauplii*, very few Larval Annelid (see sketch) Another form (see sketch) Turbellarian (as before *Sagittæ*, very few, small *Thaumantias hemisphœrica*, a few Cœlenterate ova, in *Morula* stage *Tintinnus denticulatus*, *Ceratium furca*	¼ hour 3.45 p.m.			*Thaumantias hemisphœrica*, very few *Thaumantias* (?) as before	*Pleurobrachia*, numerous

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
Plutei, a few		*Nerine* *Polydora* Turbellarian, very few	*Nauplii* a few	*Halitemora longicornis*, *Acartia longiremis*, many *Cyclopina littoralis*, *Oithona spinifrons*, very few Ostracoda, very few, *Evadne nordmanni*	*Cyphonautes*, very few	*Post-larval Natica catena* (?), a few, and other univalves	*Rhizosolenia* in abundance, many other kinds	*Tintinnus denticulatus* *Ceratium fusus*, very few Radiolarian, as before
	Some about ½ inch			1 *Dulchia porrecta* (?) 2 *Hyperia galba*, small *Pseudocalanus elongatus*			*Rhizosolenia*, and a few other kinds in surface-net	
	Bottom	**Tow-net.**						
Plutei, very few		*Tornaria*		*Acartia longiremis*, very few	*Cyphonautes*, very few		*Rhizosolenia*, and many other kinds	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature. Size, Coloration, etc.	Hydromedusæ.	Medusæ.
29th August 1888. ¾ mile N. of College 8.50 a.m.	N. 2½ fathoms	4½ fathoms Sandy	*Appendicularicæ*, very few Univalves, very few *Acartia longiremis*, *Halitemora longicornis*, Moultings of Cirripeds Megalops, very few *Plutei*, very few *Pleurobrachia*, numerous *Thaumantias hemisphœrica*, very few Ova of Cœlenterate, numerous *Tintinnus denticulatus*, very few	1 hour 9.50 a.m.		1 goby, 8 mm., permanent rays in tail	*Laodice cruciata* (*Thaumantias pilosella*), numerous *Thaumantias hemisphœrica*, numerous *Tiara* (*Oceania*) *octona*, numerous *Tiara globulosa*, very few *Stomobrachium octocostatum*, very few *Margelis ramosa* (*Bougainvillia britannica*) 1 *Thaumantias* (*Bougainvillia*) *nigritella*, young	*Beroë*, numerous *Pleurobrachia*, myriad
							1 *Stomobrachium octocostatum*, *Thaumantias hemisphœrica*, very few Ova numerous Planulæ, a few A few small gonozooids	*Pleurobrachia*, numerous
30th August 1888. 2 miles N.E. of Pier head 8.45 a.m.	N.E. 3½ fathoms	7 fathoms Sandy	*Appendicularicæ*, very few *Centropages hamatus*, very few *Halitemora longicornis* *Acartia longiremis*, very few Zoeæ, many *Plutei*, a few *Thaumantias hemisphœrica* *Obelia dichotoma*, gonozooids Cœlenterate ova	½ hour 9.15 a.m.		3 Pleuronectids, 7, 11, and 11·5 mm., smallest with permanent rays appearing in tail Clupeoids 9–11 mm.	*Laodice cruciata* (*Thaumantias pilosella*) *Thaumantias hemisphœrica*, *Oceania globulosa* *Tiara* (*Oceania*) *octona*, very few 1 *Tima bairdii*	*Beroë*, many *Pleurobrachia*, myriad

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	1, 13 mm.						*Rhizosolenia*, very few	
Bottom Tow-net.								
		Form with enormous bristles (*Sabellaria*)	1 Zoeæ *Nauplii*, very few	*Halitemora longicornis*, a few *Centropages hamatus*, a few *Pseudocalanus elongatus*, Boeck *Calanus finmarchicus*, Günner *Acartia longiremis*, Lilljeborg	*Appendicularia*, very few	Mussels, ·012 inch	*Rhizosolenia*, a few, and a few other forms	Form (see sketch)
	Many about ⅝ inch	2 *Tomopteris*, about ¾ inch	Zoeæ of Norway Lobster, very few				*Rhizosolenia*, very few, and a few other kinds in surface net	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
							Thaumantias hemisphærica, very few	*Pleurobrachia*, $\frac{3}{16}$ inch less or more; numerous Ova of *Pleurobrachia*
31st August 1888. 1½ mile N.W off Pier head ¾ mile off W. Sands 8.50 a.m.	N.E. 2 fathoms	4 fathoms Sandy	*Cyphonautes*, very few Univalves, a few Bivalves, very few, ·013 inch *Centropages hamatus*, *Halitemora longicornis*, many *Acartia longiremis*, many *Pseudocalanus elongatus* *Oithona spinifrons*, very few *Longipedia coronata*, very few Ostracoda, a few *Evadne nordmanni*, very few Larval Annelids (see sketch) 26th July	½ hour 9.20 a.m.		1 Pleuronectid-like 'witch' 2 gurnards, 5 to 6 mm. 1 † *Callionymus* (see sketch) Adult 2 *Syngnathus acus*, 41 mm., 47 mm.	*Thaumantias hemisphærica*, numerous *Tiara* (*Oceania*) *octona*, very few	*Beroë*, very few *Pleurobrachia*, myriad
			Plutei, a few Small gonozooids, very few Cœlenterate ova, a few				Small gonozooids, Many ova	*Pleurobrachia*, very few

Mid water-Net.								Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.			
	Bottom	**Tow-net.**							
Plutei, very few		Form with enormous bristles (*Sabellaria*), numerous Form (see sketch) 20th August, a few *Nerine* Form (see sketch) 25th July	Zoeæ of Norway, Lobster, many *Nauplii*, many	Mysidæ :— *Amphithoe rubricata* (?) very small *Anceus maxillaris*, young *Calanus finmarchicus* *Acartia longiremis*, numerous *Halitemora longicornis*, many *Longipedia coronata*, very few *Caligus rapax* *Pseudocalanus elongatus*, very few Ostracoda, very few	*Appendicularia*, very few	*Post-larval* Univalves, very few Mussels, ·012 inch	Many kinds	*Ceratium fusus* *Ceratium tripos*, a few *Tintinnus denticulatus*
			Zoeæ of Norway Lobster	3 *Paguri*, very small					
	Bottom	**Tow-net.**							
		Form with enormous bristles (*Sabellaria*), numerous *Nerine*, numerous Larval forms (see sketches) 25th August, and 25th July) *Polydora*; *Capitella*-like, many	*Nauplii*, many	*Acartia longiremis*, myriad *Halitemora longicornis*, many *Pseudocalanus*, *elongatus*, very few *Centropages hamatus*, many Many Ostracods	*Actinotrocha*, very few *Cyphonautes*, very few	*Post-larval* Univalves, many Mussels, ·013 inch, many	A few kinds	*Tintinnus denticulatus*, a few *Ceratium tripos*, very few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes. Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
3rd September 1888. S. side of mouth of Eden 9.20 a.m.	Towards N. bank of Eden 2 fathoms	4 t fathoms Sandy	*Cyphonautes*, very few Univalves, many Mussels, ·013 inch, a few A very few other bivalves *Halitemora longicornis*, numerous *Acartia longiremis*, a few *Centropages hamatus* *Evadne nordmanni*, very few Ostracoda, a few Larval *Nerine*, very few Larval Annelid (see sketch, 25th July) *Plutei*, very few *Pleurobrachia*, very few Ova of *Pleurobrachia*, very few *Thaumantias hemisphærica*, very few Cœlenterate ova, very few *Ceratium tripos*, many *Ceratium furca*, a few *Tintinnus denticulatus*, a few	1¼ hour 10.30 a.m.		*Callionymus*, 4·5 mm. 2 gobies, 7, 16 mm. 1 *Syngnathus*, *acus*, 43 mm. Clupeoids 10–12 mm.	*Laodice cruciata* (*Thaumantias pilosella*), a few *Thaumantias hemisphærica*, numerous 1 *Tiara* (*Oceania*) *octona* 1 *Oceania globulosa*	*Beroë*, a few, small *Pleurobrachia*, myriad
					A few minute, apparently pelagic		Minute forms A few ova	

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	A few	2 *Tomopteris*, 1 *Nereis*, young, ¼ inch		1 *Atylus gibbosus* (?) 3 *Hyperia galba* *Pandalus annulicornis*, young, 9 mm. 1 shrimp, young, 7 mm. *Schistomysis ornata*	*Appendicularia*, numerous, largest about 5·5 mm.		Many kinds, numerous in surface net	
	Bottom	**Tow-net.**						
Plutei, very few		Form with enormous bristles (*Sabellaria*) *Tornaria*	*Nauplii*, numerous	1 *Atylus swammerdami* *Nicea lubbockiana*, very few *Schistomysis ornata*, *Halitemora longicornis*, myriad *Acartia longiremis*, myriad *Pseudocalanus elongatus*, a few *Centropages hamatus* Ostracoda, a few	*Appendicularia*, numerous *Actinotrocha*, very few *Cyphonautes*, very few	*Post-larval* Univalves, very few Mussels, ·013 inch, very few	*Rhizosolenia*, numerous, and a few other kinds	*Ceratium tripos*, a few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
5th September 1888. ½ mile off Maiden Rock 10.30 a.m.	2½ fathoms	6½ fathoms Partly rocky, partly sandy	*Appendiculariæ*, a few *Cyphonautes*, very few *Phoronis*, in confinement by metamorphosis *Actinotrocha*, a few Univalves, many Mussels, ·012 inch, also other univalves *Halitemora longicornis*, many *Acartia longiremis*, numerous *Acartia bifilosa*, Giesbrecht *Centropages hamatus*, *Longipedia coronata*, Claus 1 *Atylus swammerdami* Zoeæ of Norway Lobster Ostracoda, a few *Evadne*, very few *Nauplii*, a few Larval *Nerine*, a few Larval Annelid with enormous bristles (*Nerine*) *Plutei*, a few 1 *Pleurobrachia*, small *Tintinnus denticulatus*, a few *Ceratium tripos*, a few *Ceratium furca*, a few *Ceratium fusus*, very few	½ hour 11 a.m.		1 *Cottus* (?) as before Goby, 7 mm. Rocklings, 6 and 24 mm.	*Thaumantias hemisphærica*, numerous 1 *Tiara* (*Oceania*) *octona*, *Turris*	*Pleurobrachia*, myriad, small
						1 like sand-eel (?), 7·5 mm.	A very few small gonozoids	

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Sizes, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Many	Form (see sketch), a few Form with enormous bristles (*Sabellaria*) 1 form (see sketch, 27th August)	Zoeæ of *Porcellana*	4 *Atylus swammerdami*, very few *Halitemora longicornis*, many *Acartia longiremis*, many *Pseudocalanus elongatus*, a few	*Appendicularia*, numerous *Actinotrocha*		*Rhizosolenia*, and many other kinds in surface net	
	Bottom	**Tow-net.**						
		Form with enormous bristles (*Sabellaria*) *Nerine*, many Form (see sketch (*a*), 25th July 1888), a few Form as in mid-water net	Zoeæ of Norway Lobster, many *Nauplii*, a few	1 *Atylus swammerdami* *Halitemora longicornis*, myriad *Acartia longiremis*, myriad *Centropages hamatus*, numerous *Calanus finmarchicus*, a few Another form as before	*Cyphonautes*, very few	*Post-larval* Univalves, many Mussels, ·013 inch, a few	*Rhizosolenia*, as in surface, many kinds	*Ceratium tripos*

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
8th September 1888. 1¼ mile off Pier head 1 mile N.E. of Maiden Rock 1.40 p.m.	S.E	7 fathoms Sandy	*Appendicularicæ*, a few small *Cyphonautes*, very few Mussels ·014 to ·012 inch, a few Univalves, young, a few *Halitemora longicornis*, many *Acartia longiremis*, Lilljeborg *Centropages hamatus*, Lilljeborg *Centropages typicus*, very few *Nauplii*, a few Larval Annelid (see sketch, 25th July) Larval *Nerine*, a few *Plutei*, a few 3 *Pleurobrachia*, ¼ inch	¾ hour 2 p.m.				
10th September 1888. 1¾ mile N.E. of Pier head 1.40 p.m.	E.N.E. 4 fathoms	7 fathoms Sandy	*Cyphonautes*, very few Mussels ·015 inch *Podocerus capillatus*, *Acartia longiremis*, myriad *Halitemora longicornis*, numerous Ostracoda, very few *Evadne nordmanni*, very few Young crabs (*Portunus holsatus*) Megalops, very few Larval Annelid with enormous bristles (*Sabellaria*), very few *Pleurobrachia*, very few, ⅛ inch.	¾ hour 2.25 p.m.		4 *Callionymus lyræ*, 10, 8·5 mm. Pleuronectid 11 mm. 1 flounder (?) 6 mm. 3 gurnards, 8·5, 5 mm. 2 *Gadus merlangus*, 1, 2½ inches *Nerophis æquoreus*, 26 mm.	*Thaumantias hemisphærica*, a few as before *Laodice cruciata* (*Thaumantias pilosella*), very few as before *Tiara* (*Oceania*) *octona*, very few, ripe *Margelis ramosa* (*Bougainvillia britannica*), unripe A few small Medusa buds	*Beroë*, a few *Pleurobrachia*. myriad, ⅛ to ½ inch

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
Plutei, very few		Form with enormous bristles (*Sabellaria*), very few *Nerine* (see sketch) Form (see sketch (*a*), 25th July), very few *Polynoe*, very few		*Diastylis rathkii*, very few, small *Atylus swammerdami*, *Acartia longiremis* and *Halitemora longicornis*, numerous *Oithona spinifrons*, very few *Longipedia coronata*, very few Ostracoda, a few	*Appendicularia*, very few	*Post-larval*, univalves Mussels, ·012 inch, very few	*Rhizosolenia*, and a few other kinds in surface net	
			Zoeæ, a few	Crabs $\frac{1}{16}$ to $\frac{1}{8}$ inch, numerous *Atylus swammerdami*, a few 1 *Podocerus capillatus*			A few kinds in surface net	
	Bottom	**Tow-net.**						
		Many (see sketch, 25th July) A few (see sketch (*a*), 25th July) Form with enormous bristles (*Sabellaria*), a few *Polynoe*, very few *Aphrodite*, 5 mm. *Pholoë* *Nephthys*, etc., many	*Nauplii*, numerous	1 *Atylus swammerdami* *Acartia longiremis*, myriad *Halitemora longicornis*, numerous *Oithona spinifrons*, a few *Longipedia coronata* *Pseudocalanus elongatus*	*Appendicularia*, very few	*Post-larval* Univalves, numerous Mussels, ·013 inch, ·015 inch, very few	A few kinds	*Ceratium fusus* and *tripos*, a few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size, Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
12th September 1888. ¾ mile N.E. of Pier 8.20 a.m.	2½ fathoms	4¾ fathoms Sandy	*Appendicularicæ*, very few *Cyphonautes*, very few *Actinotrocha*, a few Univalves, many *Acartia longiremis*, *Halitemora longicornis* *Pseudocalanus elongatus* *Evadne nordmanni* Larval Annelid, with enormous bristles (*Sabellaria*), very few *Plutei*, very few *Margelis ramosa* (*Bougainvillia britannica*) Ova of *Pleurobrachia*, a few *Ceratium tripos*, many *Ceratium divergens*, very few *Ceratium furca*, a few *Ceratium fusca*, a few Radiolarian (?) as before	½ hour 8.50 a.m.		*Syngnathus acus*, 2 inches disintegrated	*Laodice cruciata* (*Thaumantias pilosella*), many *Thaumantias hemisphærica*, numerous *Stomobrachium octocostatum*, very few *Tima bairdii*, very few *Margelis ramosa* (*Bougainvillia britannica*), a few *Thaumantias hemisphærica*, very few	*Beroë*, a few *Pleurobrachia*, myriad *Pleurobrachia*, very few Ova of *Pleurobrachia*, very few
13th September 1888. Near mouth of Eden, 1½ mile off Pier head 8.50 a.m.	N.E. 4 fathoms	5 fathoms Sandy	*Appendicularicæ*, a few small Univalves, many, principally *Velutina*, and other littoral forms Young mussels and other bivalves, many *Halitemora longicornis*, many *Acartia longiremis*, many *Nauplii* of Copepoda, a few Zoeæ of Norway Lobster, a few Fragment of *Tomopteris* Larval *Nerine*, a few Larval Annelid, with enormous bristles (*Sabellaria*), a few *Ceratium tripos*, many *Ceratium divergens*, many *Ceratium furca*, many *Tintinnus denticulatus*, very few Radiolarian (?), as before	$\frac{7}{12}$ hour 9.25 a.m.		8 clupeoids, 11 mm. A few clupeoids (disintegrated) 1 gurnard, 12·5 mm., young 1 *Gadus marlangus*, 3 inches	*Tima bairdii*, many *Tiara* (*Oceania*) *octona*, many *Thaumantias hemisphærica*, numerous *Margelis ramosa* (*Bougainvillia britannica*) *Stomobrachium octocostatum*, a few Another Medusa bud	*Beroë*, many as before *Pleurobrachia*, myriad, as before

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
		Larval *Priapulus* (?) *Tornaria*	Zoeæ, very few	Young crabs, numerous			Many kinds in surface net	
	Bottom	**Tow-net.**						
		Larval *Nerine*, many Form with enormous bristles, (*Sabellaria*), many Trochospheres, a few	*Nauplii*, a few	*Halitemora longicornis*, a few *Longipedia coronata*, very few Ostracoda, very few	*Appendicularia*, a few small *Cyphonautes*, very few	*Post-larval* Univalves, numerous Mussels, ·013 mm., and other bivalves	numerous, many kinds	Algoid (as before), very few *Ceratium divergens*, very few *Ceratium tripos*, a few *Tintinnus denticulatus*, very few
	1, 13 mm.			Copepoda, various immature forms			*Rhizosolenia*, myriad, and other kinds, numerous in surface net	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(d) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ	Medusæ.
								Pleurobrachia, very few
15th September 1888. ¾ mile N.W. of Rock and Spindle, 1½ mile from Pier head 10.15 a.m.	W.	7 to 6 fathoms Rocky	*Appendiculariæ*, many small *Cyphonautes*, very few Mussels, ·012 inch *Halitemora longicornis*, numerous *Acartia longiremis*, many *Centropages hamatus*, *Oithona spinifrons*, very few Zoeæ of Norway Lobster, very few Ostracoda, very few *Evadne nordmanni*, a few Megalops, very few *Nauplii*, very few Larval *Nerine*, a few Larval Annelid (see sketch (*a*), 25th July) very few Larval *Nereis*, etc. *Pleurobrachia*, very few, small *Ceratium tripos*, many *Ceratium furca*, very few Radiolarian (as before), very few	½ hour 10.45. a m.		Larval sand-eels (a few) Clupeoids, 9–11 mm.		

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Bottom	**Tow-net.**						
		Form (see sketch, 25th July), many Form with enormous bristles (*Sabellaria*), many *Nerine*, numerous *Polynoë*, many Trochospheres, many Turbellarian, as before, very few Many Nereids *Nephthys*, etc.		*Halitemora longicornis*, many *Calanus finmarchicus*, *Acartia longiremis* and *Longipedia coronata*, very few Ostracoda, very few	*Cyphonautes*, very few	*Post-larval Natica*, and other univalves, very few Mussels ·012 inch ·014 inch, very few	Many kinds	*Ceratium fusus*, very few
	Bottom	**Tow-net.**						
Plutei, very few		*Nerine*, a few *Polynoë*	Zoeæ of Norway lobster, very few *Nauplii*, very few	*Schistomysis ornata*, very few, small *Cuma* Young crabs, very few, as before *Atylus swammerdami*, a few small *Atylus bispinosus* *Podocerus capillatus*, very few *Halitemora longicornis*, a few *Acartia longiremis*, numerous *Pseudocalanus elongatus*, many *Thalestris rufocincta*, 1 specimen	*Appendicularia*, many, small *Cyphonautes*, very few	*Post-larval* univalves, many Mussels ·015 inch to $\frac{1}{20}$ inch, many	A few kinds in bottom net Many kinds in surface net	*Ceratium tripos*, very few *Ceratium furca*, very few *Ceratium fusus*, very few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1 Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
17th September 1888. 2⅓ miles N.E. from Pier head 9.15 a.m.	N.E. 2⅓ fathoms	4 fathoms Sandy	*Appendiculariæ*, very few *Cyphonautes*, very few Univalves, very few Mussels ·013 inch to ·015 inch, a few Ostracoda, very few *Centropages hamatus*, very few *Acartia longiremis*, numerous *Evadne nordmanni*, a few *Nauplii*, a few Larval *Nerine*, very few *Plutei*, a few *Pleurobrachia*, many *Ceratium tripos*, numerous *Ceratium fusca*, very few *Tintinnus denticulatus*, a few	¾ hour 10 a.m.		1 goby, 21 mm. 16 *Syngnathus acus*, 1⅙ to 2¼ inches	*Laodice cruciata* (*Thaumantias pilosella*), very few *Thaumantias hemisphœrica*, many	*Beroë*, a few *Pleurobrachia*, myriad
								Pleurobrachia, very few

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
				Young crabs (as before), numerous 1 *Atylus swammerdami*			A few A few kinds in surface net	
	Bottom	**Tow-net.**						
Plutei, a few		*Polydora*, etc. myriad Form with enormous bristles *(Sabellaria)*, numerous Trochospheres of *Polynoë*, a few Form (see sketch *(a)*, 25th July), myriad 1 *Syllis*, 3/16 inch, bearing ova *Autolytus prolifer*, ♀	*Nauplii*, numerous	*Atylus swammerdami*, very few, minute *Diastylis rathkii*, very few, minute *Halitemora longicornis*, many *Acartia longiremis*, numerous *Longipedia coronata*, many *Pseudocalanus elongatus* *Evadne nordmanni*, a few Ostracoda, very few	*Appendicularia*, a few 1 *Actinotrocha*, *Cyphonautes*, very few	*Post-larval* univalves Mussels ·012 inch to ·014 inch, a few, 2·5 mm.	Very few kinds	*Ceratium fusus*, very few *Ceratium furca*, very few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
18th September 1888. 1¾ mile N.E. from Pierhead 11.30 p.m.	S. 3 fathoms.	7 fathoms Sandy	*Appendiculariæ*, a few minute *Cyphonautes*, very few Univalves, a few Mussels ·015 inch and other bivalves, very few *Calanus finmarchicus*, very few *Halitemora longicornis*, a few *Acartia longiremis*, many *Evadne*, very few *Nauplii*, a few Zoeæ of *Porcellana*, long-spined, Larval Annelid (see sketch, 25th July), many Ova of *Pleurobrachia*, very few Young *Pleurobrachia*, very few *Ceratium tripos*, numerous Radiolarian, as before Form (see sketch)	½ hour 12 noon		3 Clupeoids, 7·5, 8·5, 13 mm. 1 gadoid, 5·5 mm. 3 gurnards, 8, 11 mm. 3 Pleuronectids, 9, 10 mm. 1 *Cottus* (?), as before, 9 mm. Sand-eel like,	*Laodice cruciata (Thaumantias pilosella)*, a few *Thaumantias hemisphærica*, many *Margelis ramosa (Bougainvillia britannica)*, very few *Thaumantias (Bougainvillia) nigritella* *Tiara (Oceania) octona*, $\frac{5}{16}$ inch	*Beroë*, many *Pleurobrachia*, myriad Ova of *Pleurobrachia*, a few

Mid-water Net.							Diatoms.	Other Forms. Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	A few	Form with enormous bristles (*Sabellaria*), very few 2 *Tomopteris*, medium size	Zoeæ of Norway lobster	Young crabs, as before, very few 1 *Atylus swammerdami*, small *Halitemora longicornis*, very few	*Appendicularia*, very few small			
	Bottom	**Tow-net.**						
Plutei, very few		*Nerine*, numerous Trochospheres of *Polynoë*, a few Form with enormous bristles (*Sabellaria*), a few Form (see sketch *(a)*, 25th July) *Polynoë longisetosus*, about 1 mm. 1 other form *Polydora cilliata*, young, 2·5 mm. Turbellarian, young	Zoeæ of *Porcellana*, long-spined, a few *Nauplii*, a few	*Halitemora longicornis*, a few *Acartia longiremis*, numerous *Harpacticus chelifer*, many *Dactylopus*, Claus *Evadne nordmanni*, very few Ostracoda, very few	*Appendicularia*, very few, minute *Actinotrocha*	*Post-larval* univalves, many Mussels ·013 inch, very few	Numerous, many kinds	*Ceratium tripos*, numerous *Ceratium divergens*, *Tintinnus denticulatus*, a few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
20th September 1888. 2 miles from Pier head, 1¾ mile from Kinkell Ness 12.30 p.m.	W.S.W. 5 fathoms	7½ fathoms Sandy	*Appendiculariæ*, very few *Natica*, very few *Acartia longiremis*, numerous *Centropages hamatus*, Ostracoda, a few *Evadne nordmanni*, very few Young crabs (*Portunus holsatus*), numerous as before *Nauplii*, numerous Larval *Nerine*, many *Thaumantias hemisphærica*, very few, ripe *Ceratium tripos*, very few	½ hour 1 p.m.		4 gurnards, 12 mm., 10 mm. 1 *Callonymus*, as before, 9 mm.	*Thaumantias hemisphærica*, numerous, ripe *Thaumantias* (See sketch), very few, unripe *Tima bairdii*, very few large and small, unripe *Tiara (Oceania) octona*, a few, unripe *Margelis ramosa (Bougainvillia britannica)*, many ripe	*Pleurobrachia*, myriad *Beroë*, many, 1 to 1½ inch Ova, very few. Probably of *Pleurobrachia*
22nd September 1888. ½ mile off Maiden Rock 12 noon	E. 5 fathoms	5 fathoms Rocky and sandy	*Appendiculariæ*, numerous, larger than before Univalves, young, many Mussels and other bivalves, ·015 inch, very few Young crabs (as before) numerous *Acartia longiremis*, myriad *Evadne nordmanni*, many *Nauplii*, a few Larval Annelids (see sketch, 25th July), a few Larval *Nerine*, a few 8 *Sagitta*, 18 mm. *Plutei*, very few *Pleurobrachia*, ¼ inch *Thaumantias hemisphærica*, ripe *Ceratium tripos*, many	⅓ hour 12.20 p.m.	clupeoids, 8–15 mm.			

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	1, 13 mm.		Zoeæ of *Porcellana*, numerous	*Atylus swammerdami*, very few, small			A few Many kinds in surface net	
	Bottom	**Tow-net.**						
		Nephthys, young *Polydora* and other numerous *Nerine*, myriad Form (see sketch *(a)*, 25th July), myriad Form (see sketch, 25th July), many Trochospheres of *Polynoë*, very few	*Nauplii*, numerous	*Acartia longiremis*, numerous *Longipedia coronata*, many Ostracoda, many		*Post-larval* Univalves, many Mussels and other bivalves, ·012 inch, very few	Very few A few kinds	
	Bottom	**Tow-net.**						
Plutei, very few		*Polynoë*, very few (see sketch) Form (see sketch, 25th July) Form with enormous bristles (*Sabellaria*), very few *Polydora*, *Aricia*, *Nephthys*, Form in tube (*Wartelia*)	*Nauplii*, a few	*Atylus swammerdami*, very small, very few *Acartia longiremis*, numerous *Halitemora longicornis*, a few *Centropages hamatus*, a few *Pseudocalanus elongatus*, *Evadne nordmanni*, a few, ♀ with young in brood-pouch Ostracoda, numerous	*Phoronis* and *Actinotrocha* (see sketch), only a few of each seen	*Post-larval* univalves, very few Mussels and other young bivalves, ·008 to ·014 inch	A few Many kinds in bottom net; and many, kinds in surface net	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	**Mid-water Net.**			
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
26th September 1888. 2 miles N.E. from Pier head 2.30 p.m.	N.E. by E. 4½ fathoms	5 fathoms Sandy	*Appendiculariæ*, very few (as before) *Cyphonautes*, very few Mussels, ·012 inch, and other bivalves Univalves, young, a few *Acartia longiremis*, numerous *Centropages hamatus* *Pseudocalanus elongatus* *Oithona spinifrons* (?) *Longipedia coronata* Ostracoda, many *Evadne nordmanni*, a few, ♀ with young in brood-pouch *Nauplii*, very few Larval Annelids, brittle, green coloration, otherwise like form in sketch of 25th July Larval *Nerine*, a few Larval *Polynoë*, very few Trochospheres of *Polynoë*, very few *Plutei*, very few 3 *Pleurobrachia*, ⅓ inch Larval *Pleurobrachia*, many Ova of *Pleurobrachia*, many, some far advanced, others not Small Medusa bud *Ceratium tripos*, many *Ceratium divergens*, very few *Ceratium furca*, very few	½ hour 3 p.m.		5 clupeoids, 10 mm. to 13·5 mm., smallest with permanent rays just about to appear in tail, largest with permanent rays in dorsal aspect of tail alone 1 goby, 6 mm., permanent rays appearing in tail clupeoids, 15–16 mm.	*Tima bairdii*, 1½ inch in diameter, unripe *Laodice cruciata* (*Thaumantias pilosella*), many large, unripe 1 *Stomobrachium octocostatum*, ripe *Tiara* (*Oceania*) *octona*, 2 unripe *Margelis ramosa* (*Bougainvillia britannica*), small, unripe	*Beroë*, 1¼ inch *Pleurobrachia* ⅛ to ⅛ inch Ova of *Pleurobrachia*, a few

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	2, 15, 16 mm.			Young crabs (as before), numerous			Very few A few kinds in surface net	
	Bottom	**Tow-net.**						
Plutei, very few		*Nerine*, many Form with enormous bristles (*Sabellaria*), many Form (see sketch, 25th July), many Larval form (see sketch), numerous Larval form (see sketch *a*), one Trochospheres of *Polynoë*, a few Many other Trochospheres	*Nauplii*, a few	*Acartia longiremis*, myriad *Halitemora longicornis*, many	*Appendicularia*, very few, as before *Cyphonautes*, very few	*Post-larval* Univalves, very few Mussels, ·014 inch, and other bivalves, a few	A few kinds	*Ceratium tripos*, very few

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
28th September 1888.			Larval forms of Copepoda, and young of several species of Copepoda			2 *Nerophis aequoreus*, $2\frac{3}{8}$, $2\frac{1}{4}$ inches	*Tima bairdii*, 1 small, unripe 1 *Thaumantias hemisphærica*, 1 *Tiara (Oceania) octona*, almost ripe	
						Pleuronectid, 11 mm. Gobies, 10 to 15 mm. Bimaculated sucker, 7·5 mm. Dragonet, 5 mm. Young whiting, 45 mm. clupeoids, 15–16 mm.		Larval *Pleurobrachia*, very few
8th October 1888. $\frac{3}{4}$ mile N.E. of Pier head 1.55 p.m.	E. 3 fathoms	5 fathoms Sandy.	Univalves, a few Mussels, ·014 inch, very few *Evadne nordmanni*, very few *Nauplii*, very few *Nerine* (larval), very few *Ceratium furca*, very few *Ceratium tripos*, very few	hour 2.45 p.m.		9 clupeoids, 17 mm. to 18 mm. Permanent rays in ventral aspect of tail, and appearing in median dorsal fin	*Thaumantias hemisphærica*, many ripe, and nearly so, $\frac{5}{8}$ inch	*Pleurobrachia*, myriad, $\frac{3}{8}$ to $\frac{9}{16}$ inch, unripe 1 *Beroë*, $1\frac{1}{2}$ inch

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	3, 15 mm.		A few Zoeæ, with long spines (*Porcellana*)	Young crabs (*Portunus*), many (as before 1 *Idotea tricuspidata*		*Post-larval* Mussels, ·045 inch, ·047 inch, a few, and others fully 2 mm. and coloured	A few in surface net	
	Bottom	**Tow-net.**						
		Different forms of *Nerine* (as before) Many Trochospheres of *Polynoë*, many other Trochospheres Form in tube (see sketch) Many, *Cirratulus*, young, about 3 mm. *Nephthys*, young	*Nauplii*, many	*Diastylis rathkii*, very few, small *Atylus swammerdami*, very few, small *Acartia longiremis*, numerous *Halitemora longicornis*, a few *Longipedia coronata*, Claus, many *Pseudocalanus elongatus*, Boeck	*Appendicularia*, small *Cyphonautes*, many	Univalves a few young Mussels, ·012 inch to ·014 inch *Spirialis*, many	Many kinds	*Ceratium tripos*, many *Tintinnus denticulatus*, a few
		1 *Tomopteris*, 1½ inch					Many kinds in surface net	
	Bottom	**Tow-net.**						
		Nerine, very few		*Halitemora longicornis*, very few Ostracoda, very few		*Post-larval* univalves, very few	A few kinds	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
10th October 1888. As before 2 p.m.	N. 3 fathoms	5 fathoms Sandy		½ hour 2.30 p.m.			*Tima bairdii*, 1¼ inch, unripe *Thaumantias hemisphærica* (as before)	1 *Beroë*, 1½ inch *Pleurobrachia*, myriad, as before
							A few ova	*Pleurobrachia*, very few, as in other net
11th October 1888. 200 yards from Pier head 8.20 a.m.	To Castle.	5 to 3 fathoms Sandy	Univalves, many Mussels, ·011, ·012 inch, and other bivalves, a few *Atylus swammerdami*, very few, small *Halitemora longicornis*, many *Acartia longiremis*, many Ostracoda, a few *Nauplii*, a few Larval *Nerine*, very few, 2 kinds *Ceratium tripos*, very few *Tintinnus denticulatus*, very few	¾ hour 9.10 a.m.				
15th October 1888. 1 mile N. of Pier head, ¾ mile N.E. of Castle 8.45 a.m.	N.E. 3 fathoms	4½ fathoms Sandy	Univalves, very few Mussels, ·011 inch, very few *Oithona spinifrons* (?), very few *Acartia longiremis*, a few *Halitemora longicornis* *Evadne nordmanni*, very few *Nauplii*, very few *Tomopteris*, very few, very small *Nereis* larvæ, very few Ova of *Pleurobrachia*, very few, (embryos well advanced) *Ceratium tripos*, very few *Ceratium furca*, very few	¾ hour 9.30 a.m.			*Thaumantias hemisphœrica*, numerous, as before *Tima bairdii*, many, unripe 1 specimen, 2 inches in diameter *Stomobrachium octocostatum*, many large, unripe A few ova	*Beroë*, many, 1½ to 2½ inches *Pleurobrachia*, myriad, ⅛ to ⅝ inch

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
	1 partially decomposed	*Nerine*, a few	*Nauplii*, a few	*Halitemora longicornis*, myriad *Acartia longiremis*, many *Longipedia coronata*, a few *Evadne nordmanni*, many Ostracoda, very few			Numerous Many kinds	
	Bottom	**Tow-net.**						
		Nerine, numerous *Polynoë*, many Sepunculoid(?) in tube *Pilidium* (Nemertean)	*Nauplii*, very few Cirripede	*Diastylis rathkii*, very few *Atylus swammerdami*, very few, small *Halitemora longicornis*, many *Acartia longiremis*, many *Longipedia coronata*, very few *Pseudocalanus elongatus* *Oithona spinifrons*	*Cyphonautes*, many	*Post-larval* Mussels, ·013 inch, A few, and one large about $\frac{1}{20}$ inch	Numerous in surface net, many in bottom net Many kinds	
		Tomopteris, a few, very small		Young crabs, a few (as before), probably Portuni *Atylus swammerdami*, very few			Myriad Many kinds in surface net	

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
								Pleurobrachia, very few Ova of *Pleurobrachia*, well advanced, very few
16th October 1888. 1½ mile N. of Pier head, 1 mile from shore 9.30 a.m.	To mouth of Eden 3 fathoms	5 fathoms Sandy	Univalves, very few *Acartia longiremis*, many *Nauplii*, very few *Nerine* (larval), very few *Ceratium tripos*, many *Ceratium divergens*, very few	⅚ hour 10.20 a.m.		1 gurnard, permanent rays 3 clupeoids, 11·5 mm. to 18·5 mm. No permanent rays in smallest 1 adult *Syngnathus acus*	*Laodice cruciata* (*Thaumantias pilosella*), many *Thaumantias hemisphærica*, numerous as before *Tima bairdii*, young, as before *Stomobrachium octocostatum*, numerous as before	*Beroë*, many, as before *Pleurobrachia*, myriad, as before *Pleurobrachia*, very few
17th October 1888. 3 miles N.E. of Pier head 11.20 a.m.	E. 4 fathoms	8 fathoms Sandy	Univalves, very few Mussels and other bivalves, ·012 inch, a few *Halitemora longicornis*, a few *Acartia longiremis*, a few *Longipedia coronata* *Evadne nordmanni* *Nauplii*, many *Plutei*, a few *Ceratium tripos*, myriad *Ceratium furca*, a very few			Adult 3 *Syngnathus acus*	*Laodice cruciata* (*Thaumantias pilosella*) *Thaumantias hemisphærica*, as before *Tima bairdii*, many	*Beroë* and *Pleurobrachia*, many, as before

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
	Very few small	*Nerine*, 3 kinds, a few *Polydora*; *Cirratulus*, young, about ⅛ inch *Polynoë*, very few		*Atylus swammerdami*, very few, small *Parathemisto oblivia*, *Halitemora longicornis*, numerous *Acartia longiremis*, *Longipedia coronata* (?) Ostracoda, very few		*Post-larval Spirialis*, very few Mussels, ·016 inch, and other bivalves, also larger mussels with coloured bands and elongated	Numerous Many kinds	
	Very few	1 *Tomopteris*		Young crabs, many (as before) *Caligus*, very few 1 *Idotea linearis*		*Post-larval* univalves, very few Mussels, ·016 inch	Myriad Many kinds in surface net	
	Bottom	**Tow net.**						
	1		*Balani*, very few	*Acartia longiremis*, numerous *Calanus finmarchicus*, a few *Halitemora longicornis* *Evadne nordmanni*, a few young		*Spirialis*, very few Mussels, ·015 inch, and other bivalves	Myriad Many kinds	
				Nephrops norvegicus, young, ⅜ inch				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.				
					Pelagic Ova, Nature, Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
								Pleurobrachia, very few as before
18th October 1888. Abreast Maiden Rock, ½ mile from shore 9.30 a.m.	E.	5 to 9 fathoms Sandy	Univalves, a few *Post-larval* Portuni, young *Calanus finmarchicus*, *Halitemora longicornis* *Acartia longiremis* Larvæ of *Balani* *Oceania octona*, and other Medusa-buds	¾ hour 10.15 a.m.				*Pleurobrachia*, very few as before Larval *Pleurobrachia*, very few Ova
30th October 1888. Abreast of Kinkell Ness 8.30 a.m.	N. 4 fathoms	8 fathoms Rocky and sandy	Bivalves, ·017 inch, very few *Halitemora longicornis*, many *Acartia longiremis*, numerous *Pseudocalanus elongatus* *Balani* (Ostracod stage), very few *Pleurobrachia*, very few	1 hour 9.30 a.m.			*Aglantha digitalis* 1 *(Circe rosea)*	*Beroë*, many *Pleurobrachia*, myriad, like largest of former *Pleurobrachia*, very few

Mid-water Net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
	Bottom	**Tow-net.**						
		Trochospheres of *Polynoë*, very few *Nerine*, very few *Nephthys* *Pholoë*	*Nauplii*, very few Zoeæ of *Porcellana*	*Atylus swammerdami*, very few *Acartia longiremis*, many *Halitemora longicornis*, many *Longipedia coronata*, very few *Pseudocalanus elongatus* Ostracoda, very few	*Appendicularia*, young	*Post-larval* Univalves Mussels, ·012 inch, very few	Myriad Many kinds	*Ceratium tripos*, myriad *Ceratium furca*, very
	Bottom	**Tow-net.**						
		Nerine, many, 2 kinds	*Nauplii*, a few	*Calanus finmarchicus*, a few *Acartia longiremis*, many *Halitemora longicornis* *Longipedia coronata*, very few *Pseudocalanus elongatus* *Evadne*, a few Ostracoda, many	*Appendicularia*, young	*Post-larval* Univalves, many Mussels, ·015 inch, ·022 inch, very few, and other bivalves	Myriad Many kinds	*Ceratium tripos*, many
	Bottom	**Tow-net.**						
	Many, 8 to 15 mm.	Two forms of *Nerine*, a few	*Nauplii*, very few *Balanus*	*Halitemora longicornis*, numerous *Acartia longiremis*, myriad *Pseudocalanus elongatus*, a few *Centropages hamatus*		*Post-larval* Univalves, a few		*Ceratium divergens*, very few *Tintinnus denticulatus*, very few 4th November (Thames) *Bacillaria pera*, abundant *Chætoceus wighamii* *Eucampia*, *Osihosira* *Rhizosolenia*, 2 specmens *Lithodesmium*

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature, Size, Larval Fishes, Nature, Size,	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
1st November 1888. 2 miles N.E. of Pier 9 a.m.	N.E. 3 fathoms	5 fathoms Sandy	Swarms of Megalops stage of crabs (*Hyas*) young Macroura, *Parathemisto*, a few; Copepoda and *Pleurobrachia*	1 hour 10 a.m.		Bimaculated sucker, 8 mm. 4 clupeoids, 14·5 mm. to 19 mm. 1 Pleuronectid (probably flounder), 11·5 mm.	*Aglantha*, a few Planulæ	*Beroë*, large, many *Pleurobrachia*, myriad (as before) and ranging from $\frac{1}{16}$ to $\frac{3}{4}$ inch, some $\frac{1}{16}$ inch
24th November 1888. Pier head 8.30 a.m.	To Castle and back	4 fathoms Sandy	*Acartia longiremis*, many Exuviæ of *Balanus*, very few *Tomopteris*, a few small Tube of Annelid *Sagitta*, many as before *Pleurobrachia*, very few, small *Aglantha digitalis* (*Circe rosea*), many	1 hour 9.20 a.m.		Young gobies, 18 to 23 mm.		*Pleurobrachia*, very few *Lesueuria*, *Beroë* (also in Thames)
5th December 1888. 2 miles N. of Kinkell Ness 2 p.m.	To 2 miles off Pier 4 fathoms	9 to 7 fathoms Sandy	1 *Atylus swammerdami* *Tima bairdii*, medium size *Aglantha digitalis* (*Circe rosea*), many *Tintinnus*, many [*Peridinum fuscus*, (in Thames) also *Tintinnus*]	2 hours 4 p.m.			*Tima bairdii*, several, one fully 3 inches across; ♂ and ♀ elements well developed, but not quite ripe *Aglantha digitalis* (*Circe rosea*), many, $\frac{5}{8}$ inch less than $\frac{1}{4}$ inch; reproductive organs developing *Stomobrachium octocostatum*, many, about $\frac{1}{2}$ inch *Thaumantias hemisphærica*, 2 or 3	1 *Beroë*, $\frac{1}{4}$ inch *Pleurobrachia*, $\frac{3}{4}$ inch downwards, reproductive elements not well developed
							Aglantha digitalis (*Circe rosea*), a few	*Pleurobrachia*, very few

Mid-water Net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Numerous and large	Larval forms of *Nerine* *Tomopteris*, chiefly small		*Diastylis*, a few Copepoda, a few				
	Bottom	**Tow-net.**						
	Numerous, large and small	Larval *Nerine* Nematodes, a few *Tomopteris*, very few, small		*Schistomysis ornata*, many 1 *Crangon vulgaris*, *Acartia longiremis*, myriad *Pseudocalanus elongatus*, numerous	*Cyphonautes*	*Post-larval* Univalves, a few Mussels, ·016 inch, very few		
								Spores of algæ Fragments of algæ, in surface net
	Bottom	**Tow-net.**						
	A few, $\frac{5}{8}$ inch			*Parathemisto oblivia* *Halitemora longicornis* *Pseudocalanus elongatus*, and *Calanus finmarchicus*, in swarms 1 *Evadne*				

Net put down, where, and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature Size, Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ	Medusæ.
6th December 1888. 1 mile of Pier head 2.30 p.m.	Towards Harbour, short distance close to ridge of Beacon rocks; 3 fathoms	5 to 7 fathoms Sandy					*Aglantha digitalis* (*Circe rosea*), many *Stomobrachium octocostatum*, many, and of about same size as before; reproductive organs in some nearly ripe	1 *Lesueuria* *Pleurobrachia*, numerous, some ¾ inch, and in good condition
10th December 1888. 100 yards N. of Pier head	½ mile N., and again S., net had touched bottom	7 fathoms	*Cyphonautes*, numerous Larval *Spirialis*, swimming with Epipodia *Acartia longiremis* *Nauplii*, a few Exuviæ of *Balanus* *Sagitta*, numerous *Pluteus*, arms short and apparently atrophied; skeletons still visible, no starfish *Pleurobrachia*, young forms with ova *Aglantha digitalis* (*Circe rosea*), a few *Ceratium tripos*, numerous *Ceratium furca* ,, *fusus*					
12th December 1888. 100 yards off Pier 10 a.m.	N.E. for ¼ mile 2 fathoms	7 to 5 fathoms		¼ hour 10.45 a.m.			*Tima bairdii*, *Aglantha digitalis* (*Circe rosea*), many *Stomobrachium octocostatum*	*Beroë*, a few
13th December 1888. 200 yards off Budda Rock 10 a.m.	Along shore to W., end of E. rocks 3½ fathoms	7 fathoms	Copepoda *Sagitta*, a few *Aglantha digitalis*, very few	1½ hour 11.30 a.m.		Clupeoid, 1½ inch	*Aglantha digitalis*, many	3 *Lesueuria* about ⅝ inch, *Pleurobrachia*, many large and small
							Aglantha digitalis	*Lesueuria* *Pleurobrachia*

Mid-water net.							Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.		
				Parathemisto oblivia, a few				
	Bottom	**Tow-net.**						
		Bristles of *Sabellaria*, and fragments of *Polynoë*		*Calanus finmarchicus* *Pseudocalanus elongatus*, Considerable number, Shells of Ostracoda	*Cyphonautes*, many	Minute shells *Littorina* (?), young		Foraminifera Fragments of algæ, in bottom net
	A few, 1¾ inch			*Parathemisto oblivia*, very few				
	In swarms, ¾ to ⅞ inch, some ½ inch and less	1 *Tomopteris*, about ¾ inch		*Parathemisto oblivia*, a few				Spores of algæ in surface net, and in bottom net
	Bottom	**Tow-net.**						
Many			Copepoda, many					

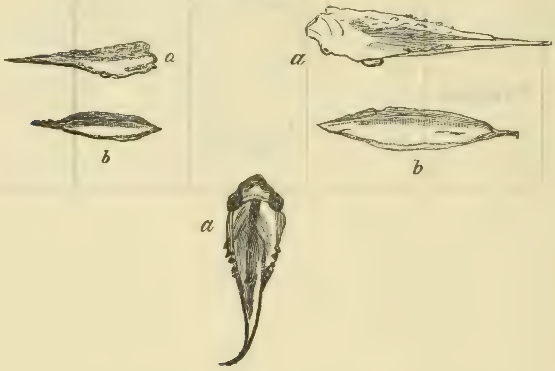
Net put down, where and time.	Course of Boat thereafter and Depth.	Total Depth of Water and Nature of Bottom.	Surface Fauna (Tow-net).	(1) Length of Time Net down, and (2) Time when taken up.	Pelagic Ova, Nature Size. Larval Fishes, Nature, Size.	Post-Larval Fishes, Nature, Size, Coloration, etc.	Hydromedusæ.	Medusæ.
14th December 1888. Site of target, N. of Battery 10.30 a.m.	E.N.E. for 1600 yards 3 fathoms	7 fathoms	1 *Tomopteris*, ¾ inch *Sagitta*, many *Pleurobrachia*, a few, about ⅝ inch and under	1 hour 11.30 a.m.			*Aglantha digitalis*, many	1 *Lesueuria*, ¾ inch *Pleurobrachia*, numerous, large, ⅙ inch to ¾ inch
								Pleurobrachia, ⅝ inch and under
18th December 1888. Opposite Castle 12 noon	Towards Eden, 3 miles course 3 fathoms	5 fathoms	*Sagitta*, a few, various sizes *Aglantha digitalis*, a few [In Thames:— *Noctiluca*, *Pleurobrachia* Infusoria in sand case Larval Molluscs, Annelids, bivalves, and a Copepod]	1½ hour 1.30 p.m.			*Aglantha digitalis*, in swarms; reproductive organs developing	Swarms of *Pleurobrachia*
							Aglantha digitalis, a few	

Mid-water net.								
Larval Echinoderms.	Sagittæ, Size, etc.	Larval Annelids and Adults.	Larval Crustaceans.	Adult Crustaceans.	Molluscoida.	Larval Mollusca, etc.	Diatoms.	Other Forms, Greenish Bodies, Remarks, etc.
	Many, some over ¾ inch in length	2 *Tomopteris* about ½ inch	1 young *Carcinus maenas* Megalops and Zoeæ of	*Parathemisto oblivia*, very few				
	Bottom	**Tow-net.**						
	Many	Bristles of *Sabellaria* and *Nereis*		*Calanus finmarchicus*, a few, small			Some	Spores of algæ Fragment of young sponge with spicules like those of *Oculina* (?)
	In swarms, same length as before, 1 inch and less Some showed sperm-cells clear and translucent, and many large			*Parathemisto oblivia*, considerable number *Calanus finmarchicus*, considerable number			Some in mid-water net	Spores of algæ, a few in mid-water net
	Bottom	**Tow-net.**						
	A few			A very few Copepoda				

IX.—NOTES AND MEMORANDA.

1. On Protective Resemblance in the Lumpsucker. By W. Anderson Smith.

Protective similarity is very common amongst fishes, and more especially amongst those inshore. The sand gobies—*Gobius minutus*—are so much like the sand amongst which they sojourn, as to be indistinguishable except when on the move. Most flat fish seem to change to an extent in colouring, to meet the ground on which they are found; and throughout the laminarian zone the law of imitation for protective purposes is very general. Perhaps the simplest and most interesting example of such imitation is to be found in the young of the lumpsucker, *Cyclopterus lumpus*, a little greenish-blue creature without any great activity. Besides its similarity in colouring to the olive-green seaweed amongst which it dwells, I have been struck with its protective similarity in another direction. At low water on Loch Creran I have seen the young in multitudes, when the capsules were being thrown from the seaweed, hovering about these, and making no effort to escape, further than dodging alongside one of the capsules which was an exact counterpart of itself, both in size and general tone of colouring. It required a very sharp eye to note the difference; and, indeed, when some scores were mixed up together, it became next to impossible to distinguish the living fish from the Alga. Their movement was a quick jerk, and then quiet, when moving from point to point. In the early spring—March–April—these little *Cyclopteri* came up in numbers from the quieter waters where the lobster traps were set, dotted all over the traps, as these were drawn out of the water, at Lochbuie, in Mull. At this time they were only 1 inch in length, although the shore during the former months—February–March—had been plentifully strewn with their coralline-ova. As they are deep and round little creatures they possibly increase slowly in length, and were then probably a year old or thereabouts, and the exceptionally heavy fishes of this species occasionally taken, up to 12 or 14 lbs., must be of great age. Like all the British sucker-fishes they are comparatively sluggish creatures; they live on decayed animal matter, and, according to some, on the excreta



a, a, a, Young lumpsuckers. *b, b*, Seaweed capsules.

of other fishes. They are very rarely taken in the dredge, and yet are numerous in their young state, as we have seen, when sought for in the proper place—sheltered waters in the laminarian zone. Here they can attach themselves to a floating frond, or dodge along among seaweed capsules, confident in their colouring and their protective similarity.

2. ON THE MULTIPLE TUMOURS IN PLAICE AND FLOUNDERS. By GEORGE SANDEMAN, St. Andrews Marine Laboratory. (Plate XVII.)

(Professor M'INTOSH, in the Scottish Fishery Board's Report III. p. 66, & IV. p. 214.)

The condition described in the above papers occurs in plaice and flounders all the year round, but chiefly from March to November. The fish affected have often an emaciated appearance, and seem to be particularly liable to the attack of such parasites as *Caligus.* The tumours occur quite irregularly on the fish : they may be situated on any part, but are most common on the fins, and especially the pectoral fin on the blind side. They consist of one or more cystic elements, often occurring close to one another. An individual cyst is surrounded by a hyaline membrane, and is in close connection with the inner surface of the skin, which is always unbroken over it. The pearly-white sphere has no deep attachment, but lies in loose connective tissue. On pressure it bursts, and exudes a white, creamy, granular substance. On section and microscopic examination these elements are seen to lie immediately beneath the pigment-layer of the skin, which is often reflected round them so as to nearly meet below. Their enclosing membrane is hyaline and apparently structureless (Plate XVII. fig. 5.) but for a radial striation in its inner layer, which gives it a close resemblance to an egg-membrane with a *zona radiata.* The enclosed material is 'minutely granular, no distinct 'cell elements being visible, though fine fibrillæ occur throughout the field, 'as if the fluid were coagulable.' It gives the staining reactions characteristic of yolk. In Pl. XVII. figs. 4 and 4*a*, may be seen one in which development has reached what appears to be the nearly complete investment of the yolk by a blastoderm, as well as certain adjacent spaces in the subcutaneous connective tissue, whence apparently other similar bodies have escaped, leaving behind the hyaline investing membrane. These single egg-like bodies occur frequently on the dorsal, caudal, and anal fins, being usually situated between the fin rays, as well as to a less extent on the dorsal and ventral surfaces. Frequently small depressions can be seen which have been the seat of this condition, but there is never any mark in the skin over the tumour while the body is still enclosed.

The larger masses vary much in size and shape, ranging from a tumour formed of two or three cysts to one of over an inch in length and half an inch in diameter. They may be broad at the base, but are usually narrow and projecting, sometimes appearing even pedunculated. They are more common on the ventral surface than are the single elements, and are specially frequent on the lower pectoral fin and lower operculum. They have been found within the buccal cavity, on the edge of the vent, and even extending a short way within. They can be seen through the skin, which is here also perfectly normal, to be composed of separate spheres (Pl. XVII. fig. 1), though these assume the cuboidal or polygonal form common where eggs are pressed together (Pl. XVII. fig. 3). The elements may be isolated, and appear in all respects like those described as occurring singly, being white, glistening spheres from 1 to 1·5 mm. in diameter. Between them is a varying amount of tissue, specially abundant near the base of the tumour, and consisting either of fibrine and leucocytes, or of more or less advanced connective tissue, in one case of myxomatous tissue. The small, round, nucleated cells described by Professor M'Intosh are invariably present, and are very abundant where there is any considerable amount of interstitial tissue. Young blood-vessels are usually present, and hæmorrhages from these, which seem to occur frequently, owing probably to the mechanical irritation to which these masses are exposed, may leave red corpuscles or pigment in the adjacent tissue. Professor M'Intosh says that the tumours bleed freely when interfered with in the living condition.

These round elements, though varying slightly in size, do not appear to grow from a very small size ; and serial sections show that all of them are fairly constant in this respect.

No noticeable pathological condition can be found constantly present in all fish which are affected by the multiple tumours, and no trace of bodies like them occurs in any of the viscera, or muscles, or on any mucous membrane.

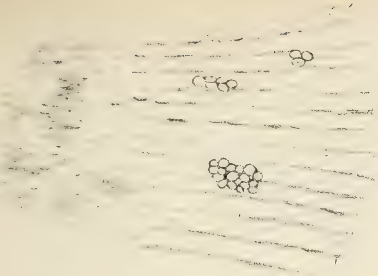
The elements of these tumours present so close a resemblance to eggs laid beneath the skin, with subsequent organisation of a mucous substance between them, or of blood-clot formed during oviposition, especially since an appearance of a developing blastoderm is occasionally present, that there would not be any doubt as to their nature, if it were not that no wound can be found through which they could have been introduced, that it is difficult to understand how any animal could force so large a mass of eggs beneath the skin so as to form a pedunculated tumour, that they seem to occur to some extent all the year round, and that it is rare to find one showing anything like development. On the other hand, they show no resemblance to any known diseased condition, being plainly not retention cysts, and being unlike any known protozoon or protophyte. No micro-organisms are present in the cysts or surrounding tissue. Professor M'Intosh found within one of these tumours *Diplozoon paradoxicum* in the adult united condition, but this is the only case in which such a parasite has been found.

PLATE XVII.

Fig. 1. Tail of flounder with multiple tumours.
Fig. 2. Large tumour from operculum of flounder.
Fig. 3. Section of above. Zeiss Oc. 1, Obj. A.
Fig. 4. Section of single cyst *in situ*. Zeiss Oc. 1, Obj. A.
Fig. 4*a*. Part of above. Zeiss Oc. 1, Obj. D.
Fig. 5. Section of large tumour. Zeiss Oc. 1, Obj. F.
Fig. 6. Skin of Montagu's sucker, showing contraction of chromatophores.
Fig. 7. Rod-like bodies from affected portion of skin.

3. ON A TUMOUR FROM A TUNNY. By GEORGE SANDEMAN, St Andrews Marine Laboratory.

This tumour (Plate XII. fig. 1) was an egg-shaped mass taken from a tunny captured in the Forth, and described in the Fourth Annual Report of the Board, and in the annals of Natural History for April 1886, p. 206. Its surface was very regular, with small rugæ running longitudinally. The length was 1½ inches and diameter ⅞ inch. There was no definite



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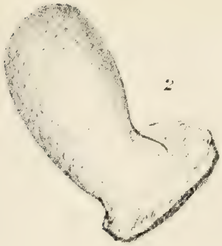

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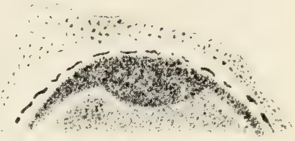

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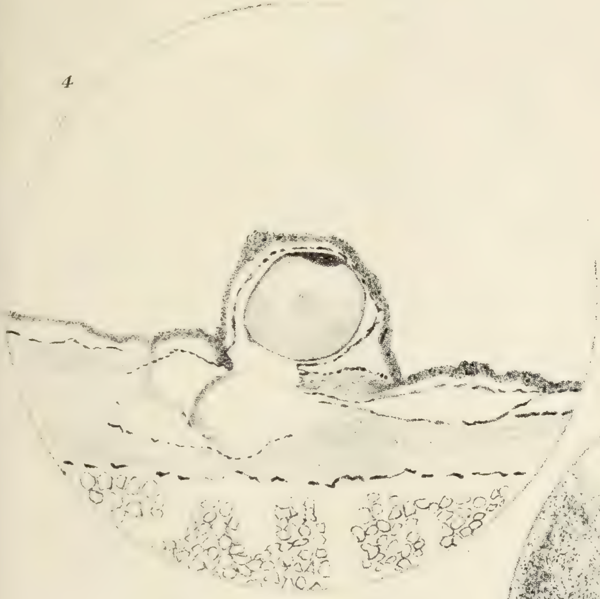

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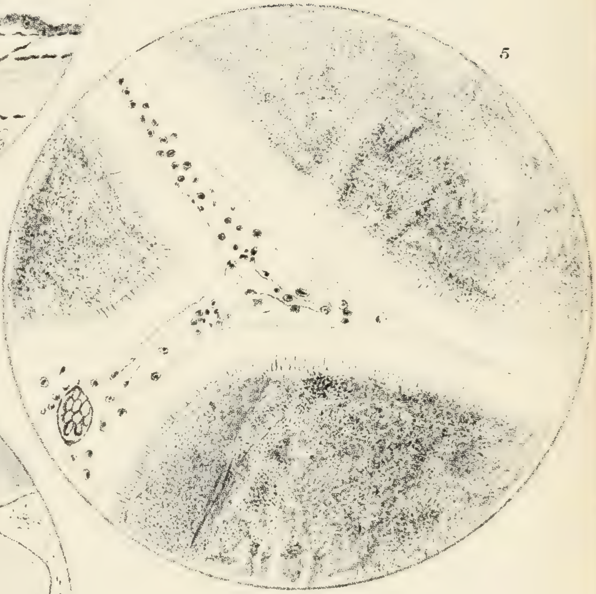

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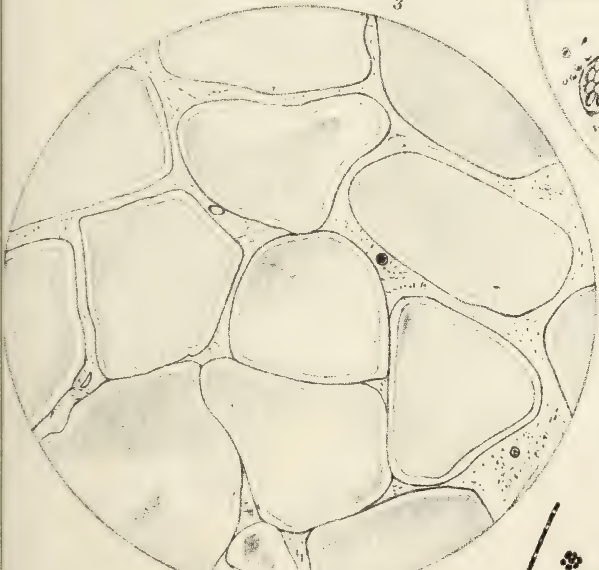

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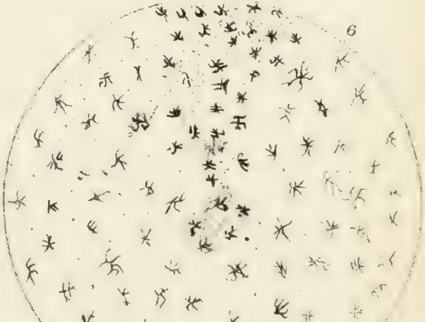

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7

G. Sandeman delt.

capsule, though its outer layers could be peeled off easily, coming away as fibrous lamellæ. On section the specimen, which had been preserved in spirit, appeared white towards the centre, and dull grey towards the periphery, where were also thickly distributed minute black spots. The mass was externally firm and elastic, becoming more loose and soft internally. The fibrous structure appeared to run mostly in the long axis of the tumour. Microscopic examination showed externally very close and firm fibres, normal in appearance, running in nearly straight bundles, with a slightly wavy course, and long nuclei at intervals. Towards the centre were swollen fibres, much more loosely arranged, with very rare nuclei, many of which were evidently undergoing degeneration. The fibres here ran a very various course, passing in bundles curved in different directions. At several places among the fibres, but chiefly externally, were small pigment granules, here and there heaped together. There was no trace of calcification. Among the fibrous bundles were masses of epithelioid cells, with large nuclei closely packed together. These apparently ran as more or less regular cylinders, as in section the epithelial masses were always circular or more or less extended ellipses. Among the epithelioid cells were large deposits of pigment, including some perfect chromatophores, large and freely branched (Plate XII. fig. 2). Some of these epithelial masses show degeneration marked by indistinctness of the nuclei. On the whole the fibrous tissue preponderates largely, the epithelioid masses being small and distant from one another. Though they form a considerable element in the mass, yet the regular form of the tumour, and the distinctness with which it is marked off from the surrounding tissues, give the whole tumour much more the appearance of a fibroma than of an epithelioma.

4. PARASITIC SKIN DISEASE IN MONTAGU'S SUCKER. By GEORGE SANDEMAN, St Andrews Marine Laboratory.

The fish affected was a well-formed female specimen of 2¾ inches long, and full of eggs. The skin over a large part of the body was abnormally light, being of a greyish-yellow colour. Here and there were distributed spots of about 1 mm. in size, which were quite white. On removing a portion of skin, it was found that the affected parts were abnormally opaque, and that the chromatophores were more contracted than those on healthy parts (Plate XVII. fig. 6). When first examined, little white masses like grains of millet seed occurred in the tissues. There were present on the surface of the skin irregular bodies surrounded by small round spores. These bodies appeared to be made up of a number of spherical masses in some cases, and in others to be due to closely apposed bundles of long rod-like elements. On section the skin was normal, except for the presence at places of a very thick cuticle, which in some cases passed down in processes into the cutis, and for the presence in some parts of a considerable number of fat globules in the inner layers of the skin. Passing through the skin in various directions were found rod-like bodies of varying length, ranging from 4 μ to long fibres of half a millimetre. They appeared in some cases to branch. Sometimes they did not stain deeply with carmine, but as a rule took up the stain and remained colourless at intervals along the fibre (Plate XVII. fig. 7). The coloured and uncoloured parts varied much in their relative lengths, even in the same fibre, and the various fibres varied considerably in width. Sometimes the coloured portion was stained much more deeply at its ends than in the middle. The rods are usually cylindrical, but moniliform rods with deeply-stained swellings are present. The rods are quite irregularly arranged, and, though usually fairly straight, have in some cases a crooked form. They lie in bundles surrounded with spores, or end to end at any angle to each other. Spore formation appears to take place by the collection of all the protoplasm to one end of the rod, where it becomes spherical. There is no appearance of fructifications bearing numerous spores. On teasing the skin these bodies were isolated and stained with various reagents. The staining portions invariably took up stains very deeply, the non-staining portions alternating with them sometimes showed a faint colour. As the fish was only obtained when dead, it was impossible to make cultivations of the fungus.

5. A COD WITH ONE EYE. By GEORGE SANDEMAN,
St Andrews Marine Laboratory.

A cod was brought in with only one eye. The orbit of the other was covered over with quite normal skin, lying level with the edges of the orbit. The skin was adherent at one point, answering to the middle of the eye. Below it was a large mass of cicatricial tissue radially arranged round the point at which it adhered to the skin. This fibrous tissue was very dense at its external surface, but became looser towards the interior. It was gritty to the knife on cutting. Imbedded in the connective tissue was a saucer-shaped mass of bone, circular in outline, answering to the base of the sclerotic. It was directed in the axis of the orbit, and had pigment in the tissue on its distal surface. Passing inwards from it was a fibrous chord, which represented the remains of the optic nerve. This disappeared entirely within the skull, and the optic nerve, when traced from within, was not joined to it, but ceased its course before reaching the foramen. A curved piece has been removed from the frontal bone, and its place supplied by dense connective tissue. There is a slight amount of asymmetry as a consequence of this old lesion. The side of the mouth under the blind eye—viz., the right—is lower than that on the functional side, but the bones of the skull appear equal on both sides. Yet, on looking along the median dorsal ridge of the skull, it is evident that the whole structure has a slight turn over to the right side, so as to raise the functional eye.

SECTION C.—PHYSICAL OBSERVATIONS.

REPORT ON THE PHYSICAL OBSERVATIONS CARRIED ON BY THE FISHERY BOARD FOR SCOTLAND IN THE FIRTHS OF FORTH AND TAY, AND IN THE CLYDE SEA AREA, AS WELL AS THE OBSERVATIONS MADE ON BOARD THE CRUISERS 'JACKAL' AND 'VIGILANT' ROUND THE SCOTTISH COASTS. By Hugh Robert Mill, D.Sc., F.R.S.E., and Andrew J. Herbertson. (Plate XVIII.)

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1. GENERAL SUMMARY FOR 1891–92.

In this report, as in the last, peculiarities in the physical conditions of the water have been specially noted, so that comparisons may be made with the data collected by the departments concerned with the details of the fishing. Much of practical value and of interest may be obtained by an examination of these two sets of facts ; but the great use of the physical observations can only be realised when a sufficient length of time has elapsed to permit averages of some stability to be calculated, and deviations from these determined.

When the average conditions, both physical and biological, are known, the occurrence of abnormalities in the former, which may be detected by the fishermen, will, in all probability, denote variations in the latter. It will be possible to calculate four or five year means for the longest established East Coast station when the returns for the year 1893 come to be discussed.

The mean temperature of the sea in 1892 was considerably below that in 1891, being from a degree[*] to a degree and a half (Oxcar) lower on the East Coast and from half a degree to a degree lower on the West Coast. Now at all the East Coast stations the mean annual temperature for 1891 was from 0° to 0°·5 lower than in 1890, with the exception of Oxcar, where the mean temperature was nearly a degree higher. The two West Coast stations where observations were made in 1890 also show a lower mean for 1891 than for the previous year, although in the case of Brodick the difference is less than the apparent one, since the 1890 mean is obtained from only nine months' observations.

The means for the past three years are arranged in the following table:—

MEAN TEMPERATURE OF SURFACE WATER FOR YEAR.

Station.	1892.		1891.		1890.	
	Fore-noon.	After-noon.	Fore-noon.	After-noon.	Fore-noon.	After-noon.
EAST COAST.						
Bell Rock,	7°·7	7°·8	8°·6	8°·7	9°·0	9°·2
North Carr,	7·4	7·5	8·5	8·7	8·9	9·0
Abertay,	7·5	7·6	8·3	8·7	8·9	9·0
Oxcar,	7·6	7·9	9·0	9·6	8·0	8·4
WEST COAST.						
Stranraer,	8·4	...	9·3	...	...	...
West Loch Tarbert,	...	9·4	...	9·9	...	...
Ardrishaig	8·8	9·0	9·2	9·5	9·4	9·8
Brodick,	8·7*	9·1*	9·3*	9·7*	9·8†	10·3†

* Taken an hour later than at other stations. † Mean for nine months only.

The water at the surface of the sea round the Scottish coasts, so far as can be deduced from the limited number of Stations where observations are made for the Fishery Board, was warmer on the whole in 1890 than in 1891, and in 1891 showed a notably higher mean temperature than in 1892.

It would be very important to ascertain the relative productiveness of the fishing of these three years, especially as regards the districts where physical observations are made.

In comparing the results obtained from the various stations it must be remembered that the East Coast observations are not made near the shore, except at Dunbar, but in deep water—either from a lightship (Abertay and North Carr), or from a rock rising sharply up to the surface (Bell Rock and Oxcar). On the West Coast the observations are made from piers or in shallow water, and the temperatures are therefore those of comparatively shallow shore water.

At stations where the temperatures of surface and of bottom waters are noted it is found that the upper layers of water are warmer during the early months of the year, and the lower layers are warmer in autumn, except at Stranraer where the bottom water is usually at a higher temperature than the surface water.

The mean annual temperature at most stations is the same as that of May and of November, being reached earlier in these months at Oxcar, Abertay, and Ardrishaig, and later at North Carr, Bell Rock, and Brodick, whereas at West Loch Tarbert and at Stranraer it coincides with that of the end of April and the second week of October.

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[*] Temperature in this report is given throughout in degrees centigrade.

The ranges of mean monthly temperatures of the surface water at the various stations are compared in the following table:—

RANGE OF TEMPERATURE BETWEEN WARMEST AND COLDEST MONTHS.

Station.	1892.		1891.	
	Forenoon.	Afternoon.	Forenoon.	Afternoon.
EAST COAST.				
Bell Rock, ...	7°·3	7°·5	7°·7	7°·6
North Carr, ...	8·3	8·5	7·5	7·9
Abertay, ...	8·4	8·2	8·9	8·7
Oxcar, ...	9·3	9·2	10·4	10·8
WEST COAST.				
Stranraer, ...	12·2	...	11·6	...
West Loch Tarbert, .	...	11·3	...	12·1
Ardrishaig, ...	7·3	7·0	8·0	8·2
Brodick, ...	7·3	7·4	6·8	7·0

The extreme ranges of surface temperatures are given in the following table:—

RANGE OF TEMPERATURE BETWEEN WARMEST AND COLDEST DAYS.

Station.	1892.	1891.	1890.
EAST COAST.			
Bell Rock, ...	8°·6	8°·6	9°·5
North Carr, ...	10·9	10·3	9·3
Abertay, ...	11·8	12·4	10·3
Oxcar, ...	...	14·4	10·2
WEST COAST.			
Stranraer, ...	15·5	15·4	...
West Loch Tarbert, ...	14·8	15·2	...
Ardrishaig, ...	13·7	9·6	12·5
Brodick, ...	10·4	11·2	...

The stations where the range of temperature is least are those where the land has not so much influence, and where the mean temperature of the surface water is latest in being reached. On the other hand, the most land-locked stations are the places where the extremes are greatest, and where the heating of the air and the land very quickly affects the temperature of the water.

These facts being ascertained, it is of importance to find how far these marked temperature differences affect the distribution and catch of fish, and how far they are of importance compared with the other physical conditions, such as situation and the admixture of fresh-water.

The Stranraer and Loch Tarbert records are so important that the observations have been published in full, and curves drawn to show the daily march of temperature. These curves have an appearance of rhythmic variation which suggested that tidal changes might explain many of the ups and downs that occur at fairly regular intervals. Accordingly, the Stranraer curve for 1891 was studied along with the tidal curve, but without yielding any definite results.

Special points call for detailed attention. For instance, the effect of the flooded river at the end of August 1892 on the fishing in the estuary of the Forth. The freshening of the water is not the only factor to be considered in this case; the influence of the muddier stream on the transparency may be of great importance. Another point is the marked arrest in the fall of temperature during November 1892.

The great value of the 'Garland' observations on the transparency of the water was pointed out in the last Report and is corroborated in the present one. It is desirable that the necessary apparatus for transparency observations be supplied to the two lightships. From regular records made at the North Carr and Abertay stations comparisons of transparency with tidal conditions may be made; and these results being studied along with fishery statistics, will propably yield valuable information. At present it is possible to show that the water in the middle of the Firth of Forth is clearest, and that that on the north side, while a little less transparent than the central waters, is notably clearer than that near the southern shores. The fishing returns might be so arranged to be comparable with these physical results, which probably have considerable influence in determining the visibility of the nets.

In the Report for 1890, a full account was given of the apparatus used at the various stations.

The temperature continues to be read in Centigrade degrees, but there are some exceptions which have to be dealt with and reduced from the Fahrenheit to the Centigrade scale before the Report can be prepared.

The instrumental errors are all very small, and no correction has been applied for them.

The Scientific Superintendent inspected some of the West Coast stations in 1892, but no other inspection has been made since last Report until March and April of the present spring, when Mr Herbertson was instructed to visit the East Coast stations. The surface thermometers in the case of the Bell Rock Lighthouse and the North Carr Light-Vessel were found to be defective, and new ones have been supplied. The hydrometers in all cases compared with the standard instruments within the necessary limits. The density observations at the Bell Rock during June, July, and part of August 1892, were made with a defective hydrometer, and, unfortunately, cannot be properly corrected. The specific gravity determinations at the Oxcar Lighthouse during some weeks of the spring of 1893 were made with a repaired hydrometer which, when tested, gave readings somewhat different from those of the standard instrument. The differences have been noted, and corrections must be applied to all the readings of that period in which that hydrometer was used before the tables for the present year can be compiled.

The specific gravity determinations are made with hydrometers graduated to register accurately at 17°·5 C., the density of pure water at that temperature being taken as = 1000·0. The temperature of the water is noted at the time the observation is made, and in order to reduce the observed specific gravity to what it would be at the standard temperature of 17°·5 C., a special table must be used. This has been calculated from that given by Professor Dittmar in his 'Challenger' Report on the Chemistry of Ocean Water. His table is calculated for a different standard temperature—that at which the density of water is a maximum = 4° C.

In order to reduce the figures of Professor Dittmar's table to those applicable to the Fishery Board's instruments, the following equation is given by Dittmar:—

$$ {}_{4}S_{t} + 1{\cdot}283 \pm 0{\cdot}0063 = {}_{17{\cdot}5}S_{t}. $$

where ${}_4S_t$ stands for the specific gravity of standard water at temperature t measured by a hydrometer graduated so that in pure water at 4° the reading is 1000·0; and ${}_{17\cdot5}S_t$ stands for the specific gravity of the same standard water at temperature t measured by a hydrometer graduated so that in pure water at 17°·5 the reading is 1000·0.

The formula adopted in preparing the following table, used in making reductions for the present Report, is

$${}_{17\cdot5}S_t = {}_4S_t + 1\cdot28.$$

Tables of Specific Gravities of Standard Sea Water compared with Pure Water at 17°·5 *C.*

$${}_{17\cdot5}S_{17\cdot5} = 1026\cdot8.$$

t°	${}_{17^\circ\cdot5}S_{t^\circ}$	t°	${}_{17^\circ\cdot5}S_{t^\circ}$	t°	${}_{17^\circ\cdot5}S_{t^\circ}$
0	1025·9	9	1028·5	18	1026·7
1	1029·4	10	1028·4	19	1026·4
2	1029·4	11	1028·2	20	1026·2
3	1029·3	12	1028·0	21	1025·9
4	1029·2	13	1027·8	22	1025·6
5	1029·1	14	1027·6	23	1025·4
6	1029·0	15	1027·4	24	1025·1
7	1028·8	16	1027·2	25	1024·8
8	1028·7	17	1027·0	26	1024·5

In order to obtain comparable results, the water tested must be brought always to the same temperature, or else a calculation be made by means of the above table to reduce the specific gravity observed to what it would have been in the same water at the standard temperature. The standard temperature is taken at 17°·5, the temperature of pure water at which the hydrometer reads 1000·0 when plunged in it, and at this temperature the table gives a specific gravity of 1026·83, which is that of the sea-water chosen as a standard at 17°·5.

This is a purely arbitrary standard, but it has been used in the 'Challenger' report, and is accordingly retained here. The 'Challenger' figure really is ${}_4S_{15\cdot56} = 1026\cdot0$, *i.e.*, a hydrometer, graduated to read 1000·0 when immersed in pure water at maximum density, will read 1026·0 when floated in this standard sea-water at 60° F. or 15°·56 C.

The method of using the table is as follows:—Suppose the reading of the hydrometer to be 1026·2 and the temperature of the water to be 10·°C. If the water had been the standard sea-water the specific gravity would have been 1028·4—2·2 higher. Hence, had the temperature of real water been 17°·5, the specific gravity would have been 2·2 less than the standard value of 1026·8, *i.e.*, it would have been 1024·6, which accordingly is entered in the tables as the specific gravity of the water tested.

After three years' experience of specific gravity observations it seems desirable to consider how far such difficult and expensive work should be continued, taking into account the very small sum of money at the disposal of the Board for carrying out these important physical observations. If a more adequate grant for this work cannot be obtained, as it is highly desirable to procure a continuous record of temperatures of the sea from many more places than at present, it would be better to stop these specific gravity determinations except on board the 'Garland.' The number of breakages makes the upkeep of density determinations expensive. The constant replacing of hydrometers involves careful testing of each new instrument, and great difficulty is experienced in obtaining satisfactory apparatus. At the lightships it is not easy to take accurate observations whenever the sea has any swell. In all cases there is the difficulty of obtaining quite comparable results, owing to slight differences in observational methods.

An approximation to salinity changes can be deduced at most seasons of the year from the temperature observations, although this would give no indication of remarkable freshenings of the water such as occurred at Oxcar at the end of August 1892. Should any of these specific gravity observations be discontinued, it becomes all the more imperative that the temperature observations be made with the utmost care, and that the thermometers supplied be all properly tested and regularly examined. The instruments should be tested at least twice a year, and each station should be visited at least once annually.

In lieu of specific gravity readings, a series of transparency observations at the two lightships would be most valuable, as well as on board the cruisers.

In order to obtain observations to give an indication of the conditions of the temperature of the sea at the more important fishing places round the coast of Scotland, it is necessary to equip several new stations. The following are suggested :—

On the East Coast observations should be made on the coast of Aberdeenshire, say at Aberdeen itself, in the Moray Firth, and in the Cromarty Firth, preferably at Cromarty if a good place can be found there, or else at Invergordon. In the Outer Hebrides, stations at Stornoway, Carloway,* and Barra are necessary. To complete the service, observers should be appointed at Oban and some place near the Mull of Cantyre—Sanda if possible.

Another matter that might be undertaken by the Fishery Board is an investigation into the effect of climate, of weather (*e.g.*, rain, direction of wind, cloud, &c.), of currents, &c., on fishing. The necessary information could be obtained best by informal conversations with fishermen of all kinds—line and trawl—whose opinions should be carefully noted. Of course, there would be many vague and contradictory statements, but a careful consideration of all statements and a tabulation of common information might lead to definite results. This is hardly a work to be accomplished by issuing printed papers of questions, but rather by personal contact and friendly talks with the fishermen themselves. The worst result will be to discover that nothing but contradictory evidence can be found, and that the present confused condition of our ideas about these important matters cannot be remedied until the results of many years of careful observations, both physical and biological, have accumulated. But it is quite as possible that some general indication of the influence of weather and of climate on fishing may be obtained and published, so that the fishermen could make use of the results, confirming or modifying them as their attention was more particularly and systematically directed to the matter.

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* Trial observations are being made at Carloway at present.

2. OBSERVATIONS ON THE EAST COAST, 1891.

Bell Rock Lighthouse.

This station is the only one at any distance from the land. Its situation well out in the North Sea makes it of especial importance, as the observations taken at it necessarily give a more accurate indication of the physical conditions on the western side of that sea than those made nearer land. By these observations an estimate can be made of the physical conditions of the water in which the farther sailing fishermen catch their fish.

The observations for 1891 have been fairly regular, the readings of the instruments having been occasionally interrupted owing to stormy weather. There are fewer afternoon than forenoon observations.

The hottest days of 1891 were the first three weeks of August, the mean afternoon temperature being 16°·5 C. No record of air temperature was given before May, so the coldest period recorded was naturally December, with a 9 A.M. mean temperature of 5°·0 C., and an afternoon mean temperature of 6°·7 C.

The surface temperatures showed the same curve as the air temperatures, but the maximum (12°·5) occurred a little later in the year, during August (afternoon) and September (forenoon and afternoon); while the water was coldest in March (4°·8 forenoon, 4°·9 afternoon)—a range of 7°·7 C. for forenoon and of 7°·6 C. for afternoon.

During the first three months of 1891 the temperature of the surface water remained fairly steady—from 5°·5 at the beginning of the year to 4°·5 in March—a regular rise then occurred until July, and the variation was very slight, from 11°·5 to 12°·5, for three months; thereafter a steady fall happened until the end of the year. (Pl. XVIII. fig. 1.)

The extreme range of temperature of surface water was from a minimum of 4°·6 at 9 A.M. on January 21, 23, March 10, 23, 24, 26, and 30, to a maximum of 13°·8 on the afternoon of July 27—a range of 9°·2.

The mean annual temperature of this water for 1891 was 8°·6 in the morning, and 8°·7 for the afternoon, about half a degree lower than that of 1890.

The mean specific gravity of the water for 1891 was 1026·0 (or 3·37 per cent. of total salts), the same as for the previous fifteen months. The mean monthly density was greatest in August (1026·3), and least in December (1025·4). (Pl. XVIII. fig. 3.) The highest specific gravity was registered on August 5 at 9 A.M., and was 1026·7; the lowest was registered on December 24 at 10 A.M., and was 1024·2. There is little daily variation in salinity, the tides apparently not affecting the proportion of salts, and the river water evidently not reaching the Bell Rock. The temperature also is practically the same morning and afternoon.

The smallness of the range of variations of temperature and the constancy of the proportion of salts in the waters around the Bell Rock are of special importance, and should have an influence on the distribution and movements of fish, possibly giving rise to less annual change in the amount of the catch in that neighbourhood than nearer land.

Abertay Light-Vessel

This station, almost due west from the Bell Rock, is at the mouth of the Tay, and consequently the temperature and the saltness of the water are greatly modified by the neighbouring land and the variations of water in the estuary. The observations from this station were discussed in great detail in the report for 1890; and the figures for 1891 bear out the points emphasised therein, both as regards the variations of conditions with the tides and their practical bearing on fishery.

The mean annual temperature of the surface layer was 8°·3 at 9 A.M. and 8°·7 at 3 P.M., respectively 0°·6 and 0°·3 lower than 1890. The mean annual temperature of the bottom water was 8°·5 at 9 A.M. and 8°·8 at 3 P.M., being 0°·4 and 0°·1 lower than 1890.

The surface water was hottest in afternoons of August (13°·4), and coldest in January and March mornings (4°·4), giving an annual range of 9 degrees, nearly a degree and a half more than at the Bell Rock. (Pl. XVIII. fig. 1.) The mean monthly temperature of the bottom water varied from 13°·0 in August to 4°·3 in March.

The hottest surface water was 15°·6 at 9 A.M. on June 21, and the coldest was measured on March 11 at 9 A.M. and found to be 3°·2, an extreme range of 12°·4 The maximum temperature of the bottom water was 14°·2 at 3 P.M. on July 16, and the minimum was 3°·1 on March 11 at 9 A.M., an extreme range of 11°·1.

The curve of the air temperature shows two minima—one in January and one in March—and the surface temperature curve has the same number of turning points. This is a feature of the temperature curves of 1891 both for air and for water at all the stations both on the east and on the west coasts, and affects the bottom water (24 fathoms in the case of the North Carr Rock) as well as the surface layers.

The salinity fluctuates greatly and is a function of tidal influence as was shown in the Report for 1890. The mean surface density for 1891 was 1023·4 (2·90 per cent. of salts) in the morning, and 1024·3 (2·87 per cent. of salts) in the afternoon; while the specific gravity of the deepest water was 1024·4 (3·06 per cent. of salts) at 9 A.M. and 1025·1 (3·20 per cent. of salts) at 3 P.M.; the difference evidently being due to the fresher river water flowing on the top.

The water is saltest on the surface in July afternoons (average 1025·2 for the month), and freshest in October or December mornings (mean 1021·5). The mean density of the deep water is constant from July to September at 1025·5, and has a minimum density of 1023·3 in October and December mornings. (Pl. XVIII. fig. 3.)

But this by no means gives an accurate idea of the great variations in salinity of the water at Abertay. The freshest surface water was found in 1891 on October 17 at 9 A.M., and had a density of 1012·8, and the saltest 1026·1 was measured three times (July 5 and 31, August 9). The least dense bottom water was 1015·6 on October 17 at 9 A.M., and the densest 1026·3 on August 31 at 3 P.M.

The variations are greatest at the surface, but the curve of density of the bottom water has the same form as that of the surface water; and both are analogous to the curve of temperature.

North Carr Light-Vessel.

The station is situated opposite Fife Ness, and, although influenced by the proximity of land, it is less affected by the river waters (of the Tay coming through St Andrews Bay and of the Forth sweeping to the N.E.) than Abertay or Oxcar.

The observations give a useful mean between those of the Bell Rock and Abertay.

The mean surface temperature for 1891 was 8°·5 C. at 9 A.M. and 8°·7 at 3 P.M., while the bottom (24 fathoms) water was not affected by daily range of temperature, and averaged 8°·7 both morning and afternoon. Here, again, the mean surface temperature was lower than that of last year, being 0°·4 less at 9 A.M. and 0°·3 at 3 P.M., while the bottom temperature was 0°·2 lower in the afternoon only, the morning mean coinciding with that of 1890.

The highest temperatures were noted at the surface on July 18 at 3 P.M. (14°·6), and at the bottom on July 10 at 9 A.M. (18°·0); the lowest readings of temperature were obtained on March 30 at 9 A.M., when the surface water was 4°·3 and the bottom water 4°·1. The extreme range of temperature of surface water is thus 10°·3, and of bottom water 13°·9.

The water was warmest in July, and coldest in March. The mean surface temperature varied from 13°·0 on July afternoons to 4°·9 on March mornings; that of the bottom from 13°·7 in July to 4°·7 in March. The range of temperature was 8°·1 on surface, and 9°·0 at bottom, less than at Abertay as regards the surface water, but more than at the Bell Rock. (Pl. XVIII. fig. 2.)

In the first ten days of July the temperature of the surface water averaged 12°·0, whereas that of the bottom was as high as 16°·0 at 9 A.M. In the afternoon the surface average was 12°·7, and that of bottom 14°·7.

The temperatures of the air, of the surface, and of the bottom water (24 fathoms), both for morning and afternoon, have been plotted, and the curves are here reproduced (Pl. XVIII. fig. 2) to show the connection between them. It will be seen that while the water follows the air in annual variation, the changes are slower and the range is less. The surface water heats and cools more slowly than the air, and the bottom water still less rapidly than the layers above it.

During the spring and early summer months the bottom water is usually colder than the surface water, which is colder than the air; in autumn and winter the surface water is warmer than the air, and the bottom water warmer than the surface water.

There are salinity observations for nine months only. Such determinations are excessively difficult to make on board a lightship. During these nine months the mean density at surface was 1025·1 (3·20 per cent. of salts) at 9 A.M. and 1025·2 (3·21 per cent. of salts) at 3 P.M., while at the bottom it was 1025·2 at 9 A.M. and 1025·4 (3·24 per cent. of salts) at 3 P.M. The 9 A.M. surface water was densest in July (1025·4); the 3 P.M. in July and September (1025·5); the bottom water was densest in July and September (1025·6 in morning, 1025·7 in afternoon). The minimum for the nine months was in November in the morning and in December in the afternoon. (Pl. XVIII. fig. 3.)

Minimum Salinities at North Carr Rock.

	9 A.M.	3 P.M.
Surface	1024·6 in April.*	1024·6 in April.*
Bottom	1024·7 in November.	1024·9 in December.

The percentage of salts in the water in which the lightship floats is fairly constant, and evidently not greatly affected by the river water, although it is not so invariable as that of the sea around the Bell Rock.

The densest surface water was found to have a specific gravity of 1026·5 (Oct. 27, 9 A.M.), and the least dense 1023·5 (Nov. 4, 18, and

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* April 21–30 only. At 9 A.M., minimum of 1026·7 occurred in November, and at 3 P.M., minimum of 1024·8 in December.

20); and the densest bottom water was of specific gravity 1026·6 (3 P.M., July 10 and Sept. 28), and the bottom water of least density 1023·8 (9 A.M., November 27).

Dunbar Harbour.

Observations were commenced at Dunbar in July; and will be of especial use in connection with the work of the zoological station at Dunbar.

The air temperature and that of the water are read twice each day at 9 A.M. and at 4 P.M.

The highest mean monthly temperature was in July—13°·4 in the mornings, and the lowest during the six months 6°·4 in December mornings, the maximum reading being 13°·8 (July 21 and 24, Aug. 13 and Sept. 12), and the minimum 5°·8 on December 22 and 23.

Oxcar Lighthouse.

This station is situated on a small isolated rock towards the northern shores of the Firth of Forth, opposite the mouth of the Almond.

The mean annual temperature of the surface water was 9°·0 at 9 A.M. and 9°·6 at 3 P.M., a degree higher than in 1890.

During the month of July the surface water was hottest (14°·3 at 9 A.M. and 15°·1 at 3 P.M.), while in January it was coldest (3°·9 at 9 A.M. and 4°·3 at 3 P.M.), a range of 10°·4 in the mornings and 10°·8 in afternoons. This is considerably greater than that of Abertay, where the difference between the hottest and coldest monthly mean was only 9°·0, whereas here it was 11°·2.

The highest temperature was read on July 17 at 3 P.M. (17°·2), and the minimum on January 10 at 9 A.M. (2°·4), giving a range between extreme temperatures of 14°·8. These results again show that Oxcar is an exceptional station, for, whereas its mean annual temperature for 1890 was nearly a degree lower than that of any other station, this year it is nearly a degree higher. The mean annual temperatures of the other East Coast stations were all lower in 1891 than 1890, whereas at Oxcar it is a degree higher. A glance at the diagram (Pl. XVIII. fig. 1) shows the change of temperature from month to month at various stations. The general trend of the 1891 curve, however, is much the same as that of the 1890 one, although the maximum occurs in July (1891) instead of in June (1890).

The mean density of the surface water at Oxcar varied from 1025·7 (9 A.M.) and 1025·6 (3 P.M.) in August to 1023·2 (9 A.M.) in November and 1023·4 (3 P.M.) in December (Pl. XVIII. fig. 3). The mean for 1891 was 1024·5 (3·08 per cent. of salts) at 9 A.M. and 1024·6 (3·10 per cent. of salts) at 3 P.M. Thus the water of the Firth of Forth 5 miles below the Forth Bridge is salter than that at the mouth of the Firth of Tay. But the extremes are not so great, Abertay water being often about as dense as that at Oxcar, but also often very much lighter, so that the influence of the volume of fresh water brought down by the Tay is more powerful where estuary and sea join, than that carried by the Forth where the estuary merges into the Firth. The difference between the two cases is indeed (as has been previously pointed out by one of us) that between an estuary properly so called, such as that of the Tay, and a firth in the stricter sense, like that of the Forth. The extremes at Oxcar are from a maximum specific gravity of 1025·9 (July 17, and August 4 and 17) to a minimum of 1021·1 (Nov. 24).

3. OBSERVATIONS ON THE WEST COAST, 1891.

Ardrishaig.

The observations are made from the stone pier at this station, which is situated near the head of the Central Division of the Arran Basin of the Clyde Sea Area at the great bend in what is termed "Loch Fyne" on the charts.

The mean surface temperature for the year was 9·2 at 9 A.M. and 9·5 at 3 P.M., very little lower than that for 1890.

The water was hottest during the month of July, having a mean temperature of 13°·1 at 9 A.M. and 13°·7 at 3 P.M.; and it was coldest in January,* being 5°·1 in morning and 5°·5 in afternoon. The mean range of monthly temperature in the early part of the day was thus 8°·0, in the afternoon 8°·2.

The maximum temperature reading was 14°·6 at 9 A.M. on September 12, and the minimum was 5°·0 on March 12 and April 6; but a reading 4°·6 ? was obtained in January—a total range of 9°·6 compared with 12°·5 for 1890.

The curve of temperature obtained by plotting ten-day means (Pl. XVIII. fig. 1) is very irregular, but shows clearly the rise in February and the depression in March common to all stations. In August there is a minimum after the July maximum, and a second but lower maximum is reached in September. After that date the temperature of the water rapidly sinks.

Brodick.

The observations here are made from the end of the iron pier at 10 A.M. and 4 P.M. instead of 9 A.M. and 3 P.M. as at other stations. The mean annual temperature was 9°·3 in the forenoon and 9°·7 in the afternoon, very little higher than at Ardrishaig, yet not so great as West Loch Tarbert, but again considerably greater than at East Coast Stations except Oxcar. The mean for 1891 is half a degree below that for previous nine months.

In the morning the water was warmest in August and September, giving a mean of 12°·6 each month, and coldest in March, 5°·8, while in the afternoon the water averaged 13°·0 in August and 6°·0 in March (Pl. XVIII. fig. 1). Owing to the warmth of the water in winter the mean range is low, being only 6°·8 in morning and 7°·0 in afternoon, the smallest mean variation, and approached only by the Bell Rock.

The extreme range is 11°·2, the maximum temperature of 15°·2 occurring on August 5, and the minimum of 4°·0 on the morning of March 11.

The curve of temperature plotted from ten-day means is much more regular than that of Ardrishaig, but shows the same second minimum in March and second maximum in September. (Pl. XVIII. fig. 1.)

West Loch Tarbert.

Observations were begun at the beginning of the year at this station, which is situated near the head of the loch, the exact point of observation varying from time to time within narrow limits, according to the part of the oyster banks on which the observer is employed. They are made only once a day—at 3 P.M.

The mean annual temperature of surface water was 9°·9, that of the bottom 9°·8; the highest of any station, although that of Brodick approaches it. The warmest month was July—surface 16°·1, bottom 16°·2; the coldest January, when both surface and bottom were at 4°·0—a range of 12°·1 for the upper and of 12°·2 for the lower layers of water. This is a mean range over four and a half degrees more than at the Bell Rock and over five degrees more than at Brodick. It is greater than that at any other station.

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* The readings for January 1–10, 1891, were a little uncertain.

The maximum surface temperature was 17°·6 on 18th July, the minimum 2°·4 at 3 P.M. on January 21. The maximum bottom temperature was 17°·5 on 18th July, and the minimum 2°·8 on January 21 at 3 P.M. This gives an extreme range of 15°·2 for surface and of 14°·7 for bottom water. The daily observations are printed in full in Table IX. (1891), and curves drawn. The great range is accounted for by the shallowness of the water, the greater part of the upper end of the loch not exceeding 2–4½ fathoms, which is the depth at the place of observation.

Stranraer, Loch Ryan.

The observations here were also initiated at the beginning of 1891. They are made at 9 A.M. only, and are taken at the upper end of the loch, in mid-channel, opposite the west end of the town of Stranraer, except in rough weather, when they are taken from the end of the west pier.

The mean annual temperature of the surface water was 9°·3, that of the bottom water 9°·4, about the same as that of the other West Coast Stations, and nearly a degree higher than at the East Coast Stations except Oxcar.

The mean monthly surface temperature was a maximum during July, when it was 15°·6 at the surface and 15°·5 at the bottom; and was a minimum in January 4°·0 at the surface and 4°·1 at the bottom—a mean range of 11°·6 at the surface and 11°·4 at the bottom.

The greatest surface temperature was 17°·0 on 25th June, and the minimum 1°·6 on March 11—an extreme range of 15°·4; while the maximum bottom temperature was 17°·0 on June 25, and the minimum 1°·8 on March 11—a range of 15°·2.

The curve, like those of other stations, shows a marked depression in March, and a very rapid falling off of temperature after the mean maximum in July.

The observations for West Loch Tarbet and for Stranraer have been published *in extenso* (Table IX., 1891), and curves have been drawn of these daily observations. This will allow a comparison with oyster and other fishing statistics, and show clearly the relation of temperature to the various biological phenomena noted in another part of the Report.

The many marked irregularities in the curve drawn from these daily observations have been examined and compared with the tidal curve at the same hours. In many cases there appears to be a relation between the variations of temperature and of tide, but so many contradictory cases exist that no definite connection between the two can be shown.

As yet no salinity observations have been made at the West Coast Stations, but the proportion of salts at various parts of the Clyde Sea Area has been worked out by Dr Mill.* Continuous records of salinity extended over a long period, when compared with tidal and other influences and discussed with respect to the distribution and catch of fish, would prove valuable, especially as regards sudden changes of density; but much may be discovered about the average percentage of salts from a discussion of the temperature observations.

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* See paper on the 'Clyde Sea Area,' by Hugh Robert Mill, D.Sc., F.R.S.E., in the *Transactions of the Royal Society of Edinburgh*, xxxvi. p. 641 *et seq.*

4. OBSERVATIONS ON THE EAST COAST, 1892.

Bell Rock Lighthouse.

The observations of the temperature and of the specific gravity of the surface water are taken at 9 A.M. and at 3 P.M. The former are made in the sea itself, the latter in the library of the lighthouse after the water has been allowed to come to a steady temperature.

Owing to the roughness of the sea at this station it often is impossible to make direct observations at all states of the tide. There are many blanks in the register, especially during the winter months. It has been arranged that in future approximate readings be made on such occasions by drawing a tub of water into the lighthouse and immediately determining its temperature, the records so obtained being specially marked. Both for temperatures and for specific gravities, however, there is a sufficient number of readings to give ten-day means very near what the real figure must be. Special marks have been inserted in Table V., 1892, to show what number of observations was used in determining the mean.

One serious gap in the specific gravity and salinity tables is caused by the hydrometer used during that period being damaged. The observer writes—'The specific gravity for the months of June and July and up 'to the 9th August is not correct as our glass was damaged. The new 'one arrived on the 9th August and then we found there was about 1 of 'difference between the damaged one and the new one.' It is, however, impossible to apply a satisfactory correction to the actual observations, for the observer remarks—'The difference would not be so great in the month 'of June, but latterly water was getting into the glass, which caused so 'great a difference.' (Table XIV., 1892.)

The mean temperature of the air at the Bell Rock for 1892 was 7°·9 at 9 A.M., and 8°·8 at 3 P.M., the corresponding means of the temperature of the surface water being 7°·7 and 7°·8. The surface water was 0°·9 colder than in 1891, and nearly a degree and a half colder than in 1890.

The curve of temperature for the surface water has the same form as in previous years, except for a very sudden rise in May corresponding to a period of very high air temperatures. The minimum monthly mean was that of March, when the water was 4°·1 in the forenoon, and 4°·2 in the afternoon, and the mean maximum at 9 A.M. was 11°·4 in August and September, and at 3 P.M. was 11°·7 in August—a mean range of 7°·3 in the forenoon, and 7°·5 in the afternoon. (Pl. XVIII. fig. 4.)

The extremes show a maximum of 12°·4 on the afternoons of August 17 and 24, and a minimum of 3°·8 at 9 A.M. on the 8th, 10th, and 15th of March—range 8°·6.

The mean morning air temperature was reached about the middle of May, and again in the second week of October. In the afternoon the mean was the same as that of April 1–10 and 21–31, and of the beginning of November. The surface temperature was the same as the annual mean at the end of May, and again at the end of November.

The mean annual density of the water was 1025·6 (pure water being reckoned 1000), which is equivalent to a 3·27 percentage of total salts.

The mean monthly specific gravity of the water was highest (1025·9) on September mornings and May afternoons, and lowest in August (1025·2 at 9 A.M. and 1025·3 at 3 P.M.), but the variations are very slight, and it must be remembered that the early August readings gave too low specific gravities, owing to the hydrometer being damaged. (See Pl. XVIII. fig. 6, for curve.)

The densest water was found on May 19, at 3 P.M., and had a specific gravity of 1026·3; the water was least dense on the mornings of 9th and 10th August, and its specific gravity was 1024·6.

The lightkeepers report that a very vivid display of St Elmo's fire took place during a severe snowstorm last winter. The attention of the keeper on duty was drawn to it when he was firing the explosive cartridges used as alarm signals.

Abertay Light-Vessel.

Except from June 27 until July 14, when the ship was in dock, the observations have been made very regularly.

The mean morning temperature of the air was 7°·7, that of the surface water 7°·5, that of 3-fathom water 7°·9, and that of the bottom water (6 to 10 fathoms) 8°·0. The corresponding means for the afternoon were—air 9°·9, surface 7°·6, 3 fathoms 8°·1, and bottom 8°·1. The mean surface temperature at 9 A.M. was lower by 0°·8, and at 3 P.M. by 1°·1 than in 1891. The mean temperature of bottom water was 0°·5 and 0°·7 lower than in 1891 in the forenoon and afternoon respectively.

The following table shows the maxima and minima of mean monthly temperatures for 1891 and 1892, also the ranges:—

Mean Monthly Temperatures, Abertay, Maxima and Minima.

	1892.		1891.	
	9 A.M.	3 P.M.	9 A.M.	3 P.M.
Minimum—				
Surface . .	3°·6 (Mar.)	3°·9 (Mar.)	4°·4 (Jan., Mar.)	4°·7 (Jan.)
Bottom .	4·0 (Mar.)	4·2 (Mar.)	4·3 (Mar.)	4·8 (Jan., Mar.)
Maximum—				
Surface . .	12·0 (Aug.)	12·1 (Aug,)	13·3 (Aug.)	13·4 (Aug.)
Bottom .	12·1 (Aug.)	12·1 (Aug.)	13·0 (Aug.)	13·0 (Aug.)
Range—				
Surface . .	8·4	8·2	8·9	8·7
Bottom .	8·1	7·9	8·7	8·2

The minimum monthly mean is fully half a degree lower than in 1891, the maximum over a degree lower, and the range averages half a degree less.

The highest recorded temperature of the surface water was 14°·2 at 9 A.M. on August 22, and that of the bottom water was 13°·6 at same time. The lowest reading for surface water was 2°·4 at 9 A.M. on January 13 and 14, and for bottom water 3°·4 on March 14. The extreme range was therefore 11°·8 on surface and 10°·2 at bottom, compared with 12°·4 and 11°·1 in 1891.

In spring the mean air temperature was reached towards the end of April, the mean surface temperature early in May, and that of the bottom water about the middle of that month. In autumn the air temperature was the same as the mean of the year early in October, the upper layers of water at the beginning of November, and the bottom water at the end of November and early in December.

Looking at the curves (fig. 5) drawn from figures published in Table I., 1892, those for the surface and the bottom temperatures almost coincide until August, but the curve for the deeper water is somewhat higher in the early months of the year. From September onwards the temperature curve of the bottom water is markedly above that of the surface water. A steady fall of temperature took place during September and October, but from the beginning until the end of November neither the surface nor the bottom temperatures varied by a degree, and both rose slightly during the first half of the month. In the first ten days of December the temperatures of both upper and lower layers of water fell nearly 2°. The air temperature curve shows a rapid rise at the beginning of this period, and a very sudden fall of between 4° and 5° at the beginning of December.

It will be noticed, on studying fig. 5, that the bottom water was later in being affected by this change of air temperature, and preserved the effects of it for a longer time than did the surface water.

A marked change in the curve of salinities and specific gravities occurs during this warm period, and shows that the surface water was relatively very much fresher than the bottom water. This is another case of abnormal physical conditions being very clearly shown by the observations made at the Fishery Board's stations. It is very desirable that the fishing returns for this period be carefully studied in connection with its peculiarities.

The mean specific gravity of the surface water at 9 A.M. was 1023·3 (2·87 per cent. of salts), and at 3 P.M. 1024·0 (3·00 per cent. of salts); that of 3-fathom water 1023·8 (salts, 2·97 per cent.) and 1024·5 (salts, 3·08 per cent.); while the bottom water was 1024·3 (3·05 per cent. salts) in the morning and 1025·0 (3·18 per cent. salts) in the afternoon. The density of the water during 1892 averaged almost the same as in 1891. The water in the afternoon is markedly salter than in the morning, both in 1891 and 1892.

The maxima and minima for 1892 and 1891 may be compared from the following table:—

MEAN MONTHLY SPECIFIC GRAVITIES, ABERTAY, MAXIMA AND MINIMA.

	1892.		1891.	
	9 A.M.	3 P.M.	9 A.M.	3 P.M.
Maximum—				
Surface . .	1024·4 (May, Aug.)	1024·8 (May)	1025·1 (July)	1025·2 (July)
Bottom . .	1025·0 (May, July, Aug.)	1025·5 (Aug.)	1025·4 (July)	1025·5 (July, Aug., Sept.)
Minimum—				
Surface . .	1021·5 (Nov.)	1023·0 (Nov.)	1021·5 (Oct. and Dec.)	1023·4 (Dec.)
Bottom . .	1023·3 (Nov.)	1024·6 (Nov.)	1023·3 (Oct. and Dec.)	1024·7 (Dec.)

There was therefore no marked difference between the salinity conditions of the water at the mouth of the Tay estuary in 1891 and 1892; but the surface water was hardly so dense in 1892 as in 1891, when the extreme mean monthly specific gravities are considered.

The actual extremes are—surface maximum, 1025·7 at 3 P.M. on August 25; surface minimum, 1013·3 on October 6 at 9 A.M.; bottom maximum, 1026·0 on June 12, 13, and 19, and August 1 and 2; bottom minimum, 1015·2 on October 6 at 9 A.M.

The salinity curves of this station are shown in Pl. XVIII. figs. 5 and 6.

North Carr Light-Vessel.

Owing to the constant pitching of the vessel, the instruments (especially the hydrometer) cannot be read so accurately as at a rock station. When the sea runs high great difficulty is experienced in making any observations, and in very rough weather the attempt to continue the record has to be given up. In a fog the observers have other duties which prevent them making the observations.

The records are sufficiently continuous to give good enough means, but the data are not so trustworthy as those of steady stations.

The mean annual temperature of surface water at North Carr was 7°·4 at 9 A.M. and 7°·5 at 3 P.M., fully a degree below that of 1891. At 12 fathoms the mean was 7°·8 and 8°·0, and at the bottom 7°·9 and 8°·0, in the forenoon and afternoon respectively. The bottom mean temperature was only seven-tenths of a degree below that of 1891.

The minimum and maximum monthly means for 1892 are both lower than those for 1891, viz. :—

MEAN MONTHLY TEMPERATURES, NORTH CARR, MAXIMUM AND MINIMUM.

	1892.		1891.	
	9 A.M.	3 P.M.	9 A.M.	3 P.M.
Minimum—				
Surface . .	3°·2 (Feb.)	3°·4 (Feb.)	4°·9 (Mar.)	5°·1 (Mar.)
Bottom . .	4·2 (Mar.)	4·0 (Mar.)	4·7 (Mar.)	4·7 (Mar.)
Maximum—				
Surface . .	11·5 (Aug.)	11·9 (Aug.)	12·4 (July)	13·0 (July)
Bottom . .	11·5 (Sept.)	11·6 (Sept.)	13·7 (July)	13·5 (July)
Range—				
Surface . .	8·3	8·5	7·5	7·9
Bottom . .	7·3	7·6	9·0	8·8

The range of monthly mean temperatures is somewhat less than for 1891; but in 1892, as in 1890, the range of surface temperatures is greater than that of bottom temperatures, 1891 being anomalous in this respect.

Of temperatures of surface water the highest reading was 13°·1, recorded at 3 P.M. on September 8, and the lowest was 2°·2, recorded at 9 A.M. on February 19. The highest temperature of bottom water was 13°·3 at 3 P.M. on July 9, and the lowest was 3°·3 at 9 A.M. on March 10. The extreme range is thus 10°·9 for the surface and 10°·0 for the bottom water.

The mean annual temperature of the air was the same in spring as that of the last days of April and the first period of May, and in autumn it corresponded to that of the middle of October in the forenoon, and to that of the first half of November in the afternoon. The surface water reaches the annual mean in the middle of May and towards the end of November, both in the forenoon and in the afternoon. The bottom layers have the mean annual temperature at the end of May and the beginning of June, and in the last week of November and the first week of December.

The curves of surface and bottom temperatures (fig. 5) show the usual characteristics—the surface temperature being lower during the first four months of the year, and again in the last four, and higher in summer. The depth of water being considerable (24 fathoms), the curve of temperatures of the lowest layers does not show the same fluctuations corresponding to slight changes in the air temperature that the surface curve does, and in July, when the surface temperature reaches a first maximum, the bottom water is not so markedly heated, but shows a steady rise. The arrest of the falling of the temperature in November, shown in the case of the Abertay station, is also evident in the North Carr curves.

The mean annual densities of the water at 9 A.M. for 1892 were at the surface 1025·4 (salts, 3·24 per cent.), and at the bottom 1025·5 (salts, 3·26 per cent.). At 3 P.M. they were 1025·5 at the surface and 1025·6 (salts, 3·27 per cent.) at the bottom.

The highest and lowest monthly means are compared with those of 1891 in the following table:—

MEAN MONTHLY SPECIFIC GRAVITIES, NORTH CARR, MAXIMUM AND MINIMUM.

	1892.		1891.*	
	9 A.M.	3 P.M.	9 A.M.	3 P.M.
Maximum—				
Surface . .	1026·1 (Sept.)	1026·3 (July, Sept.)	1025·4 (July)	1025·5 (July, Sept.)
Bottom . .	1026·2 (July, Sept.)	1026·5 (July, Sept.)	1025·6 (July, Sept.)	1025·7 (July, Sept.)
Minimum—				
Surface . .	1024·3 (Feb.)	1024·1 (Feb.)	1024·6† (April)	1024·6† (April)
Bottom . .	1024·4 (Feb.)	1024·4 (Feb.)	1024·7 (Nov.)	1024·9 (Dec.)

The densest water was found at 3 P.M. on July 9—surface 1028·7, bottom 1028·4; and the least dense on the surface on February 9 and 11 at 3 P.M. was 1023·0, and at the bottom on February 18 at 9 A.M. and February 19 at 3 P.M. was 1024·0.

Oxcar Lighthouse.

The observations are made of the temperature of the air and of the surface water, and of the specific gravity of the surface water very regularly at 9 A.M. and 3 P.M.

The mean annual temperature of the water for 1892 was 7°·6 in the morning, and 7°·9 in the afternoon—a degree and a half lower than in 1891.

The mean monthly temperature was highest in August, being 12°·5 at 9 A.M. and 12°·7 at 3 P.M., and lowest in March, when it was 3°·2 in the morning, and 3°·5 in the afternoon. The mean monthly range was therefore 9°·3 and 9°·2, compared with 10°·4 and 10°·8 in 1891, both maximum and minimum being lower in 1892. The temperature of the air was markedly lower in 1892 compared with 1891, and at this station, which stands where the estuary merges into the firth of the Forth, the effect of the sun's heat is much more powerful than tidal influence.

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* Eight months' observations.

† Ten-day mean.

Two minima of air and water temperatures were recorded in the spring of 1892. In the middle ten days of January the air temperature was 1°·5 at 9 A.M. and 2°·4 at 3 P.M., the surface water at the same hours being 3°·4 and 3°·6. In the last ten days of January the air temperature had risen to 5°·6 and 6°·4, and the water to 3°·9 and 4°·2. During the first ten days of February the air averaged 4°·2 and 6°·7, and the water 4°·5 and 4°·8. Then a slow fall took place until the normal minimum was reached in the first ten days of March, when the mean temperature of the air was 0°·9 and 3°·4, and that of the water 2°·7 and 3°·0.

During the last ten days of April, and again at the middle of October, the temperature of the air coincided with the mean of the year. The surface water reached the mean annual temperature a little later—about the middle of May and during the first fortnight of November.

The temperature of the water rose steadily until the beginning of June, when it fell during a cold spell in the middle of the month. It rose again, and then fell during another cold period in July. The water was warmest in August, and then grew colder, the temperature remaining stationary during the warm period at the beginning of November and at the end of the year.

The extreme range of temperature of surface water was 10°·8, the maximum being 13°·8 (Aug. 1, 4, and 25) and the minimum 3°·0 (Mar. 29). Compared with the range of 14°·4 of 1891, this is small.

The mean specific gravity of the water was 1024·2, equivalent to 3·03 per cent. of salts. This is very little below the mean for 1891.

The greatest mean monthly densities were 1025·0 at 9 A.M. in May and August, and 3 P.M. in May; and the least were 1023·0 at 9 A.M. in November, and 1023·2 at 3 P.M. in November.

But the maximum density registered in 1892 was 1025·8 at 3 P.M. in May 12 and 14 and August 2, and the freshest water was found at 3 P.M. on the last day of August and gave as low a specific gravity as 1014·1—much lower than any recorded in 1891, and, in fact, the lowest on record. Exceedingly heavy rains had fallen during the two previous days, and the large volume of fresh water brought down by the rivers must have floated on the salter water with comparatively little intermixing with it. The lighthouse-keepers report that on the day when this very remarkable reading was obtained no appearance of any tidal current could be seen on the surface, but the upper waters flowed steadily seawards all day. The relief boat which came to the lighthouse at this date had much difficulty in making the rock owing to the strength of the outward flowing current.

The specific gravity curve (fig. 6) shows the double minimum so marked in the temperature curve in January and March, but to a much less degree.

It would be interesting to compare the fluctuations in the catch of fish at such stations as the Bell Rock, North Carr, and Oxcar, and see if the numbers for the first station are most constant, and if the constant variations of temperature and specific gravity of the water in the Forth estuary influenced the success of the fishermen. The effect of the floods at the end of August making the waters of the estuary fresher and muddier than usual on the take of fish might also be ascertained.

Dunbar Harbour.

The observations from this station, begun in the summer of 1891, have been obtained by Mr Jamieson. Unfortunately, Mr Jamieson's other duties prevent the record from being continuous.

The mean temperature of the water for 1892 was 8°·0, the forenoon mean being 7°·8, that of the afternoon being 8°·2. It was hottest in August (9 A.M. 12°·3, 3 P.M. 12°·4), and coldest in March (9 A.M. 3°·8, 3 P.M. 3°·6)—a range of 8°·5–8°·8. The highest monthly mean was a degree lower than in 1891, but the minima cannot be compared, since observations at Dunbar were not made until the latter half of that year.

The extreme range was 12°·4, the maximum of 15°·4 occurring at 3 P.M. on June 8, and the minimum of 3°·0 at 10 A.M. on March 11.

The curve obtained by plotting Dunbar observations has the same characteristics as those of the other stations, and closely follows that of the air temperature. The arrest of the fall in November and again at the end of 1892 is seen here very clearly.

5. OBSERVATIONS ON THE WEST COAST, 1892.

Ardrishaig.

Observations were made regularly at Ardrishaig except during the months of July, August, and September, when they were very irregular. No readings were taken from September 8 until October 2. The thermometer, which is graduated to fifths of a degree Centigrade, was read to fifths only.

The mean annual temperature was 8°·8 in the morning and 9°·0 in the afternoon—about half a degree lower than in 1891.

The maximum mean monthly temperature was that of August—12°·3 at 9 A.M. and 12°·5 at 3 P.M. The minimum monthly mean was 5°·0 at 9 A.M. and 5°·5 at 3 P.M. in March—a mean range of 7°·3 in the morning and 7°·0 in the afternoon. The range is a degree less than in 1891. The surface water does not vary so much in the afternoon as in the morning, owing mainly to its greater warmth at 3 P.M. than at 9 A.M. in the early months of the year.

The extremes show a much greater range (13°·7), for the maximum temperature was 14°·6 at 3 P.M. on August 23, and the minimum 0°·9 on more than half a dozen occasions—in January (18, 21, 22), February (22), and March (10, 11, and 14).

The curve of surface temperature is more regular than that of 1891. The minimum at the end of 1891 gave place to a maximum at the end of January 1892, and then the curve turned down to another minimum, which was reached in March. The upward motion of the curve consists of several leaps and rests, the two practically equal maxima on the ten-day means being reached in July and again at the end of August. These maxima of ten-day means are only 12°·9 on July 11–20, 13°·1 August 21–31, compared with 15°·6 for June 21–30, and 13°·2 August 21–31 in 1891. A steady fall, broken here and there by slight rises, characterises the rest of the curve, the most marked elevation occuring in November. A minimum occurs at the beginning of December, and then the curve rises 2 degrees, to fall again through the same distance during the last period of the month.

The line of mean annual air temperature crosses the curve of the ten-day surface means about the end of April and the middle of October. The mean annual surface temperature gives a line cutting the curve of ten-day means at the beginning of May, at the end of the third week of October, when there is a minimum, and again in the middle of November.

Brodick.

The record of observations made at Brodick is complete. The mean surface temperature for the year was 8°·7 in the morning and 9°·1 in the afternoon, showing a marked excess in the annual average temperature of the water at 3 P.M. compared with 9 A.M. This mean is six-tenths of a degree below the mean temperature in 1891, both at 9 A.M. and 3 P.M., and consequently fully a degree lower than that of 1890.

The maximum monthly means were 12°·8 at 9 A.M. and 13°·1 at 3 P.M. in August, and the minima were 5°·5 and 5°·7—a range of 7°·3 and 7°·4. This is half a degree greater range than that of 1891, the minima being three-tenths lower, and the maxima two-tenths and one-tenth higher than in the previous year.

Nor are the extremes so far apart, for the maximum reading was 14°·6 on August 1 and again on August 24, and the minimum 4°·2 on the forenoons of February 19 and 20—a range of 10°·4. While the mean monthly range is greater, that of the extremes of temperature is eight-tenths of a degree less than that of the previous year.

The curve of surface temperature is fairly regular, showing arrests both in rise and in fall. The highest point was reached in the last ten-day period of June, but there was a second and not much lower maximum at the end of August.

The mean surface temperature for the year coincides with that of the last period of May, and with that of the middle of November, much later dates than those for the surface temperatures of other stations.

West Loch Tarbert.

Very regular observations have been taken, but only at 3 P.M.

The mean annual temperature of the surface water was 9°·4, and that of the bottom water, which varies in depth from 2 to 4½ fathoms, was also 9°·4. This is 0°·5 lower than mean surface temperature, and 0°·4 lower than mean bottom temperature for 1891.

The highest monthly mean was that of August (surface, 15°·4; bottom, 15°·3), and the lowest that of January, when the mean surface temperature was 4°·1, and the mean bottom temperature 4°·3. The range of mean surface temperatures is thus 11°·3, and that of bottom 11°·0. The highest monthly mean is fully three-quarters of a degree below that of 1891, and the lowest is from one- to three-tenths higher.

The highest readings during the year were 17°·0, recorded on August 2 and 23 at the surface, and 16°·6 obtained on the former date at the bottom. The minima were 2°·2, observed on March 3 and 10 at the surface, and on March 3 at the bottom. The extremes are thus 14°·8 and 14°·4, compared with 15°·2 and 14°·7 in 1891.

The curves of the water temperatures follow those of the air very closely, showing a marked break in the regular rise corresponding to colder periods at the beginning of June and of July; the rise of temperature at the end of October and the beginning of November is well marked, and after a sharp fall of about 3° in the last two ten-day periods of November the falling curve turns upwards in sympathy with a rise of the air temperature in the first period of December.

There is comparatively little difference between the surface and bottom temperatures, the former being one or two tenths of a degree higher in summer and lower in winter.

The line of mean temperature was reached about the same period in the springs of 1891 and 1892, but somewhat earlier in the autumn of 1892 than in that of 1891. In 1892 the air was at its mean temperature at the end of April and in the second week of October: the surface water was a day or two later in reaching the mean, and the bottom water still a day or two later. In both years a temporary rise of air temperature took place in autumn, but about a fortnight earlier in 1891 than in 1892.

Stranraer, Loch Ryan.

The figures printed in the air column of the tables were obtained from a thermometer hanging inside the watch-room, and therefore are indicative merely of seasonal changes. The temperatures of the bottom water are taken at depths varying from 8½ to 19 feet, depending on the state of the tide.

The observations are very regularly made, but are taken only at nine o'clock in the morning.

As at other stations, the mean temperature of the water for 1892 is lower than in 1891, and by about a degree at Stranraer. The mean surface temperature was 8°·4, and that of the bottom 8°·6.

The monthly means are compared in the following table:—

MEAN MONTHLY TEMPERATURE, STRANRAER, MAXIMUM AND MINIMUM.

Monthly Means.	1892.		1891.	
	Surface.	Bottom.	Surface.	Bottom.
Maximum . .	14°·8 (Aug.)	15°·1 (Aug.)	15°·6 (July)	15°·5 (July)
Minimum . .	2·6 (Jan.)	2·7 (Jan.)	4·0 (Jan.)	4·1 (Jan.)
Range . . .	12·2	12·4	11·6	11·4

Similarly the extremes may be compared:—

ACTUAL TEMPERATURE READINGS, STRANRAER, MAXIMUM AND MINIMUM.

Daily Readings.	1892.		1891.	
	Surface.	Bottom.	Surface.	Bottom.
Maximum . .	16°·1 (July 31)	16°·3 (July 31)	17°·0 (June 25)	17°·0 (June 25)
Minimum . .	0·6 (Jan. 16)	0·6 (Jan. 16)	1·6 (Mar. 11)	1·8 (Mar. 11)
Range . . .	15·5	15·7	15·4	15·2

From these figures it appears that the water was never so warm during 1892 as in 1891, but yet the range both of monthly means and of daily temperatures was greater in 1892 than in 1891. This is due to the much colder winter temperatures of the water last year. These variations of the temperature of the water, which were somewhat greater in 1892 than in 1891, while the water on the whole was colder, should be compared with the history of the oyster-beds during 1891–92.

During the whole of 1892 the bottom temperature was one or two tenths of a degree higher than that of the surface water, whereas in 1891 the two were practically coincident. The temperature curve for 1892 begins by rising from a minimum, which happened at the end of 1891, and turns down again at the end of January to a second minimum, reached in the middle of February. Thereafter the rise is very steady, with two breaks at the beginning of June and the beginning of July, until the maximum is reached at the end of that month and the first days of August. A marked rise of temperature occurs in November, as in 1891, and a minimum is reached shortly before the end of the year.

The surface and bottom temperatures were the same as the annual mean at the end of April, and again in the second week of October, exactly as in the case of the other West Coast stations except Brodick.

6.—PHYSICAL OBSERVATIONS MADE ON BOARD THE 'GARLAND,' 1891–92.

The observations of pressure, temperature, and transparency made on board the "Garland" in 1891 at nine Stations in the Firth of Forth are printed in Tables on pages 439–41. Similar observations and salinity records in addition, taken during 1892 at ten Firth of Forth Stations and at five Stations in St Andrews Bay, will be found on pages 470–77.

A map showing the exact position of these Stations was inserted in the Ninth Annual Report. Observations at Station X. are published for the first time this year. It is situated off Limekilns, above Queensferry.

The 'Garland' observations were made once a month at each station in the Firth of Forth, and also monthly, except in July, August, and September, at Stations in St Andrews Bay. They are carried out with great care and skill, and afford very reliable and important material for the full discussion of the Physical conditions of the Firth of Forth. This is too extensive an investigation to be dealt with in the present Report, but special attention may be paid to one set of observations of unique interest.

The observations on the transparency of the waters of the Firth of Forth were discussed for the first time in the Ninth Annual Report. The method of determining it is by sinking a white enamelled disc, 3 feet in diameter, until it just disappears from view. A note is made of the number of fathoms the disc is below the surface when this happens.

The clearness with which objects can be seen through the water seems a matter of capital importance for the fishermen using nets or even lines, and consequently special attention is again directed to the results of the "Garland" observations.

The depth of visibility depends on the amount of light, determined by the height of the sun, so by the season and hour of observation, on the cloudiness of the sky, on the transparency of the air, as well as on the clearness of the water. The first named factors necessarily have a large influence in determining the depth at which the white disc vanishes as long as the water is of fairly constant clearness; and the seasonal variations, shown in the accompanying tables, are almost wholly due to these factors in the case of the St Andrews Bay Stations, and those towards the mouth of the Firth of Forth. But the clearness of the water itself varies. In winter-time the flooded rivers often bring down great quantities of suspended matter, and partly cause the diminished depth of visibility at the Upper Forth Stations. This sediment, which obscures the water higher up the river, makes the transparency diminish as the Firth and Estuary are ascended. Again at the west end of Station IV., where the Esk and the Water of Leith both have some influence, and where the water is usually very muddy, there is very little seasonal variation; whereas at Station IX., which is E.S.E. of the May Island, the seasonal variations are well marked, as the mean readings for four years show (winter 5·0, summer 7·0); and also the maximum and minimum tell.

The mean transparencies have been calculated for each half-year, and are tabulated below: —

Mean Transparency of Water of Firth of Forth during the four half-years 1891–92.

Station.	1892.						1891.					
	West End of Station.			East End of Station.			West End of Station.			East End of Station.		
	Low Sun.	High Sun.	Mean.	Low Sun.	High Sun	Mean.	Low Sun.	High Sun.	Mean.	Low Sun.	High Sun.	Mean.
I.	2·4	2·9	2·6	2·8	4·2	3·5	2·2	2·8	2·5	3·2	4·1	3·7
II.	2·9	3·8	3·3	3·4	4·3	3·8	2·8	4·2	3·5	2·8	3·9	3·4
III.	2·5	3·4	2·9	2·2	3·0	2·6	2·5	3·0	2·8	2·8	3·8	3·3
IV.	1·7	2·3	2·0	2·0	2·6	2·3	1·9	2·4	2·2	2·0	3·0	2·5
V.	3·8	5·5	4·6	4·1	5·6	4·8	4·5	6·4	5·3	5·1	6·6	5·7
VI.	3·4	5·2	4·2	3·3	5·7	4·4	3·6	5·0	4·2	3·9	5·8	4·8
VII.	2·3	4·0	3·1	2·9	4·6	3·7	2·9	3·9	3·4	3·5	4·2	3·8
VIII.	3·8	6·6	5·1	4·8	7·8	6·1	4·1	5·0	4·6	5·9	6·2	6·0
IX.	5·2	7·9	6·5	6·4	8·5	7·5	6·0	7·1	6·6	6·2	6·9	6·6
X.	0·6	0·7	0·7	0·6	0·7	0·7	.	.	.	.	.	.

The maximum and minimum readings for the same periods are collected in the following tables:—

Transparency of the Water in the Firth of Forth.

Maxima and Minima for four half-years, 1891–92.

Station.	1892.							
	West End of Station.				East End of Station.			
	Low Sun.		High Sun.		Low Sun.		High Sun.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
I.	3·2	1·5	3·5	2·5	3·5	2·0	6·0	3·5
II.	4·0	1·5	4·0	3·0	5·0	2·0	5·5	2·8
III.	3·0	2·0	5·0	2·5	2·8	2·0	3·5	2·5
IV.	2·0	1·5	3·0	1·5	3·0	1·5	3·0	1·8
V.	5·0	2·0	7·0	3·0	5·0	3·5	7·0	3·0
VI.	5·0	1·8	7·0	4·5	5·0	1·8	7·0	3·0
VII.	3·0	1·5	4·5	3·0	4·0	2·0	5·5	3·5
VIII.	6·0	3·0	9·0	4·5	6·8	3·0	9·0	6·0
IX.	7·0	3·5	9·0	6·5	8·0	4·5	9·5	7·0
X.	0·8	0·5	1·0	0·5	0·8	0·5	1·0	0·5

Station.	1891.							
	West End of Station.				East End of Station.			
	Low Sun.		High Sun.		Low Sun.		High Sun.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
I.	3·0	2·0	4·0	1·5	4·5	2·5	7·0	2·8
II.	3·5	2·0	7·0	3·0	3·2	2·5	6·5	3·0
III.	3·5	2·0	4·0	1·5	3·5	2·0	5·0	1·5
IV.	2·8	1·0	3·0	2·0	2·5	1·8	4·5	2·0
V.	6·0	3·2	7·0	6·0	6·0	3·0	7·5	6·0
VI.	4·5	2·5	6·0	3·0	5·0	2·8	7·0	5·0
VII.	3·5	2·5	5·0	2·5	5·5	2·5	5·5	2·0
VIII.	5·0	3·5	7·0	3·0	9·0	4·0	8·0	3·5
IX.	9·0	4·0	10·0	3·8	9·5	2·8	9·0	3·5
X.	.	.	.	.	.	.	.	.

These tables show that the observations for 1889–90 discussed in the Ninth Annual Report gave results relatively constant, since the means for 1891–92 lead to the same conclusions, although they differ a little in their value.

The means of the four years' observations at our disposal have been calculated, and fully bear this out.

The following table shows—

MEAN TRANSPARENCY OF THE WATER IN THE FIRTH OF FORTH for four years 1889–92.

Station	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Low Sun, Half-Year.									
West End of Station, . .	2·1	2·7	2·2	1·7	4·0	3·1	2·3	3·6	5·0
East End of Station, . .	2·7	2·8	2·2	1·9	4·2	3·1	3·0	4·7	5·4
High Sun, Half-Year.									
West End of Station, . .	2·6	3·6	2·8	2·2	5·3	4·6	3·3	4·8	7·0
East End of Station, . .	3·8	3·8	2·9	2·4	5·4	4·9	4·0	6·4	7·1
Year.									
West End of Station, . .	2·4	3·2	2·5	2·0	4·6	3·8	2·8	4·2	6·0
East End of Station, . .	3·2	3·3	2·6	2·2	4·8	4·0	3·5	5·6	6·2

The Stations may again be grouped into Central, Northern, and Southern, and the mean transparencies for four years be arranged in order, passing from the Stations further west to those at the mouth of the Forth:—

TRANSPARENCY, CENTRAL STATIONS.

Stations	Off Inchkeith.			Between Elie Ness and Fidra.	Off May Isle.	S.W. of May.		Open Sea.
	I. W.	III. W.	I. E.	V. W.	V. E.	VIII. E.	IX. W.	IX. E.
Four Year Means.								
Summer,	2·6	2·8	3·8	5·3	5·4	6·4	7·0	7·1
Winter,	2·1	2·2	2·7	4·0	4·2	4·7	5·0	5·4
Range,	0·5	0·6	1·1	1·3	1·2	1·7	2·0	1·7

The figures show an increasing transparency the further down the Firth the observations are made, and they also show that as the water becomes clearer seasonal variations have greater influence on the transparency.

The northern Stations similarly arranged show the same characteristics:

TRANSPARENCY, NORTHERN STATIONS.

Station	Off Inchkeith. I. W.	Kirkcaldy. II. W.	Leven. II. E.	St Monans. VI. W.	Anstruther. VI. E.
Four Year Means.					
Summer,	2·6	3·6	3·8	4·6	4·9
Winter,	2·1	2·7	2·8	3·1	3·1
Range,	0·5	0·9	1·0	1·5	1·8

And the southern Stations:

TRANSPARENCY, SOUTHERN STATIONS.

Station	Off Musselburgh.	Aberlady.		Fidra.	North of Bass.	South-West of Bass.
	IV. W.	IV. E.	III. E.	VII. W.	VII. E.	VIII. W.
Four Year Means.						
Summer,	2·2	2·4	2·9	3·3	4·0	4·8
Winter,	1·7	1·9	2·2	2·3	3·0	3·6
Range,	0·5	0·5	0·7	1·0	1·0	1·2

The central waters are the clearest, and these round the Fife coast are more transparent than those round the shores of the Lothians.

If the fishing returns were compared with these figures some interesting results might be expected.

The observations made at the Stations in St Andrews Bay have been tabulated in the same way as those of the Firth of Forth. The mean transparencies for each half-year and for the year, and the maximum and minimum readings during the summer and winter six months of 1892, are given below:—

TRANSPARENCY OF WATER IN ST ANDREWS BAY IN 1892.

Station.	West End of Station.						Year.	East End of Station.						Year.
	Low Sun, Half-Year.			High Sun, Half-Year.				Low Sun, Half-Year.			High Sun, Half-Year.			
	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Mean.
I.	3·2	2·0	2·8	5·0	3·5	4·2	3·3	4·0	3·0	3·2	6·0	4·0	4·7	3·8
II.	3·0	2·0	2·8	5·0	3·5	4·3	3·4	3·5	3·0	3·1	4·0	3·0	3·6	3·3
III.	3·5	2·5	3·1	5·0	3·0	4·2	3·5	3·0	2·5	2·8	5·2	3·5	4·4	3·4
IV.	3·2	1·0	2·3	4·0	3·0	3·7	2·8	3·0	2·0	2·5	5·5	3·0	3·8	3·0
V.	5·0	3·0	3·6	6·0	3·0	4·8	4·0	4·0	2·8	3·2	6·0	3·5	4·8	3·8

The mean for the winter half-year is that of five monthly observations, and that for the summer half-year of three observations.

Grouping these Stations into those near the shore, and those out in the bay, and arranging them in order so that those furthest north and nearest the mouths of the Eden and the Tay come last, the following figures are obtained :—

MEAN TRANSPARENCY OF THE WATER IN ST ANDREWS BAY.

Shore Stations—Near the mouth of the Eden.

Station	I. W.	II. W.	III. W.	IV. W.	Mean.
Summer, . . .	4·2	4·3	4·2	3·7	4·1
Winter, . . .	2·8	2·8	3·1	2·3	2·8
Range, . . .	1·4	1·5	1·1	1·4	1·3

Bay Stations—From Kingsbarns to Abertay.

Station	V. S.E.	I. E.	II. E.	III. E.	V. N.W.	IV. E.	Mean.
Summer, . . .	4·8	4·7	3·6	4·4	4·8	3·8	4·4
Winter . .	3·2	3·2	3·1	2·8	3·6	2·5	3·1
Range, . . .	1·6	1·5	0·5	1·6	1·2	1·3	1·3

The lowest transparency records are those of Station IV., which is so situated that the west end is at the mouth of the Eden, and the eastern end at the mouth of the Tay.

Comparing the transparencies at the two ends of Station V., which is furthest from the shore, with those of No. IX. of the Firth Stations situated outside the Isle of May, we have 4·0 and 3·8 to contrast with 6.5 and 7·5. The depth of visibility at the outside of St Andrews Bay is a little less than that near Elie Ness and a little more than that of Fidra in the Firth.

The temperatures of the surface water when similarly classified are shown in following tables :—

TEMPERATURES OF SURFACE WATER IN ST ANDREWS BAY.

Shore Stations—Near the mouth of the Eden.

Stations	I. W.	II. W.	III. W.	IV. W.
	°	°	°	°
Summer, ...	8·4	8·3	8·6	8·2
Winter, ...	6·1	6·0	6·3	6·3
Range, ...	2·3	2·3	2·3	1·9

Bay Stations—From Kingsbarns to Abertay.

Stations	V. S.E.	I. E.	II. E.	III. E.	V. N.W.	IV. E.
	°	°	°	°	°	°
Summer, . .	7·7	7·8	8·1	8·0	7·7	7·7
Winter, . . .	6·5	6·5	6·4	6·5	6·5	6·2
Range, . . .	1·2	1·3	1·7	1·5	1·2	1·5

It appears that the nearer inshore the observations are made the maximum temperatures become higher and the minimum lower, and so the annual range is the greater. Thus the greatest range is found at these Stations near shore and is 2°·3, whereas the smallest is little more than half (1°·2) and is that of Station V. the furthest out in the bay.

The grouping of the specific gravity observations gives the following results :—

Stations	IV. W.	II. E.	V. S.E.	V. N.W.
1892.				
Summer, ...	1024·9	1024·7	1025·5	1025·3
Winter, ...	1024·4	1024·8	1025·1	1024·6
Mean, ...	1024·6	1024·8	1025·3	1025·0

The mean specific gravity of the Station nearest the shore is the least, and is greatest in the south side of the bay, where the river waters have least influence. The salinity is most constant at the southern part of the bay, and varies most where the fresh water is most abundant : the great range at the north end of Station V., which is well away from the shore, may be due in part to the influence of the Eden, and in part to that of the Tay.

The general result of these observations in St Andrews Bay is to show that the physical conditions are very constant in the southern part, and have somewhat greater variations in the region where the river waters mix with those of the sea ; and that the water at a distance from the shore is steadier in temperature, and of slightly greater transparency, no doubt on account of the sand stirred up by the waves near shore, and the gradual settling down of the mud carried out by the rivers towards the open sea.

7.—OBSERVATIONS OF TEMPERATURE MADE ON BOARD THE CRUISERS 'JACKAL' AND 'VIGILANT,' 1887–92.

When it was decided in 1886 to make regular physical observations on board the cruisers employed under the Fishery Board, a complete system for taking the temperature of the water at various depths twice daily was drawn up by Dr Gibson and Dr Mill. This is published in the *Annual Report* (1887), p. 309. It was hoped that, by fixing the hours of 9 A.M. and 3 P.M. for these observations, the cruisers moving from place to place round the coast of Scotland would have opportunities for two temperature soundings daily in fairly deep water. Many circumstances, however, have affected the value of the results, and they are far from being so satisfactory for the purpose of following the annual changes of temperature as we originally hoped. The naval routine on board the 'Jackal' frequently prevented the vessel being stopped for observations when on a passage, and most of the deep-water observations were made from the 'Vigilant,' to whose Commander very much credit is due. The importance of the deep-sea observations (*i.e.*, in depths over 40 fathoms), is greatly limited by their small number, and, after a vast amount of labour had been expended by us on the consideration and grouping of these data, we found ourselves again reluctantly compelled to postpone their full discussion until more have been collected. These deep-water observations will not lose their value, but rather increase in importance by the delay in treating them fully. They will serve in the open waters of the West Coast to continue the elaborate special researches made on the 'Jackal' in 1887, and reported on in the *Sixth Annual Report*, p. 349. On the East Coast they will connect the various special cruises of the 'Garland' and 'Jackal' in the Moray Firth, and across the North Sea. In the partially enclosed waters of the Clyde Sea Area, the results of the many admirably executed deep-soundings of the 'Vigilant' will enable the temperature changes of that great body of water to be traced from year to year. In themselves, these observations would be insufficient for the purpose, but the earlier years of observation coincided with the researches of the Scottish Marine Station, which have been exhaustively discussed (*see* 'The Clyde Sea Area,' by Dr H. R. Mill, Part I., Physical Geography; Part II., Salinity; *Trans. Roy. Soc. Edin.*, xxxvi. p. 641; Part III., Temperature, *Trans. Roy. Soc. Edin.*, for 1893). The data for this region, obtained during the years 1887 and 1888, are given in a special Table in this Report, and their significance is referred to in a special paragraph. The later observations will enable a fairly trustworthy history of the temperature changes of the Area to be compiled, but it is inadvisable to attempt this at present.

As a matter of fact, most of the cruiser observations were made while the vessels were at anchor, and many of them are valueless on account of the shallow or stagnant water in which the vessel lay. In many natural harbours, frequented by the cruisers, the water was fairly deep, and the tidal currents strong enough to overcome the local irregularities, and give a trustworthy character to the results. It is these observations in natural harbours which have been selected for publication and discussion here.

Twelve harbours formed the head-quarters of the cruisers for a sufficient time to make this mode of treatment practicable. Of these, nine were on the West Coast. Three of them were in the Outer Hebrides, viz., Stornoway Harbour in the north, Castle Bay, Barra, and Vatersay Bay in the south and south west of the great chain of islands. One was on the comparatively open part of the coast of the mainland off Oban, and the remaining five in the more sheltered harbours of the Clyde Sea Area, viz., Campbeltown Loch and Lamlash in the south, Rothesay Bay and Fairlie

Roads at the head of the more open waters, and theestuary off Greenock at the most distant point from the sea. Three only were on the east coast, Kirkwall Bay in Orkney, which may be taken as representative of the meeting of Atlantic and North Sea water, Wick Bay in the extreme north-east, and Cromarty Firth in the comparatively deep and sheltered water of the Cromarty Firth, which may be viewed as the head of the Moray Firth.

The actual observations are published in the Tables, and, whenever they were sufficiently numerous, as in the case of Rothesay, Stornoway, and Invergordon, these results were combined in the form of means for 10-day periods, and monthly means as well. The 10-day and monthly means of the three Stations mentioned are published in this Report. Such observations made by expert observers from vessels afloat in water at least deep enough to overcome the effects of purely local heating and cooling are of very considerable value. Irregular as they are, they are worth more than the regular readings taken from a pier or rock in places where the water, in which the instrument was immersed, had flowed over rocks or sand previously heated or chilled by direct exposure to the air. But on account of the irregularity of the observations, being sometimes omitted for several months at a time, and gaps of a week or a few days occurring very often, the results are on the whole less satisfactory than those made at lightships.

In order to bring out the individual peculiarities of the three chief cruiser Stations, Tables have been constructed, showing how the monthly mean temperature varied with respect to some of the fixed Stations.

Campbeltown Loch.—Observations were made in depths of from 9 to 12 fathoms, and as a rule the temperature was found to be practically uniform from surface to bottom, the surface being a little warmer in summer and a little colder in winter than the rest of the water. The highest surface temperature observed during the sixty observations spread over five years was 12°·7 on 21st June 1888, but the water as a whole was warmest on 24th September 1890. The lowest temperature noted was 5°·7 on 16th February 1888.

Lamlash Harbour.—This harbour is a deep bay on the eastern side of Arran, the mouth of which is protected by Holy Island, leaving narrow channels through which the tide runs strongly at the north and south. The anchorage was at different times in depths of from 12 to 20 fathoms. On no occasion was there any pronounced difference of temperature between the surface and bottom ; differences of even half a degree were rare, and in by far the greater number of cases there was not more than one-tenth of a degree of variation. This is a somewhat remarkable state of matters, closely resembling the condition of things which prevails outside the Clyde Sea Area in the open Channel, in which, by the way, neither of the cruisers made any observations. It is obviously due to the complete mixing of the water by means of tidal currents, and the temperature of the whole body of water, corresponding to that of the surface in the 'Firth of Clyde' outside, shows that the bars across the entrances to the harbour keep back the lower layers of the outside water, and keep Lamlash harbour supplied entirely with the superficial waters. The greatest warmth found was 13°·3 on 25th September 1890, the coldest 5°·6 on 7th March 1888. The water of Lamlash harbour is characterised by remarkable transparency, and, being of comparatively high salinity, it is a sort of natural aquarium swarming with invertebrate life.

Rothesay Bay.—This bay formed the head-quarters of the cruisers on the Clyde for the greater part of their stay in these waters. The geographical conditions of the bay are interesting, as it occurs where the tortuous channel of the Kyles of Bute and the long straight trough of

Loch Strivan meet the northern extension of the deep water of the Arran Basin * coming from the south, and the Dunoon Basin * coming from the east. A channel of deep water (over 30 fathoms) runs from Loch Strivan across the mouth of the bay and joins the deep channels of the basins to the east and south. The water in this channel has been proved to be greatly affected by the direction of the wind acting on the long straight valley of Loch Strivan, and tending to produce strong superficial or under currents.

The following is a summary of the dates at which forenoon and afternoon observations were made by the cruisers at anchor, in from 8 to 15 fathoms in Rothesay Bay :—

Number of Days when Observations were made in—

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
1887, . .	...	...	...	2	4	3	...	...	...	20	20	23
1888, . .	13	12	7	...	6	...	...	...	...	22	10	15
1889, . .	6	9	9	1	...	...	3	...	3	9	9	8
1890, . .	8	6	3	3	3	...	...	...	5	7	3	4
1891, . .	8	5	4	4	2	...	...	...	3	7	3	3
1892, . .	...	...	5	3	...	6	...	...	2	4	7	8
Total, .	35	32	28	13	15	9	3	...	13	69	52	61

This shows a good number of observations for the winter months, but practically none for the warmest period from June to September.

The range of temperature between surface and bottom varied considerably with the season, but was never great, probably because there are no observations for the months of great range. The highest surface temperature for any 10-day period was 13°·7 for June 1–10, 1892. In other years the warmest period occurred in September or October, with a temperature of about 12°·0. The coldest surface water for a 10–day period was 4°·7 at the end of February 1887 ; the period of absolute minimum for each year was always in the middle, or end of February, or the beginning of March ; at these times the surface water was considerably colder than that below. The warmest month appears to have been September 1890 (surface 13°·3, 10 fathoms 12°·7), the coldest March 1892 (9 A.M., surface 5°·1, 10 fathoms 6°·0). The range of diurnal temperature, *i.e.*, between the 9 A.M. and 3 P.M. observations is of some interest. So far as the rather slender data, allow us to judge, the mean diurnal range for the whole period was 0°·3 at the surface, and 0°·1 at 10 fathoms. The fact of afternoon warming only comes out in the period from March to May, and from November to January. Its absence, or very small value in September and October is very marked, but doubtless the afternoon warming was most marked at the period during which the cruisers were absent from Rothesay Bay. The distinct evidence of afternoon warming in November, December, and January is difficult to understand or explain. Too much stress must not in any case be laid on these observations.

A special Table is devoted to a comparison of Rothesay with other Stations ; the symbol + means that the surface water at Rothesay is warmer, the symbol – that it is colder than the surface water of the other Station at the same times. The figures following the signs give the number of degrees or fractions by which the temperature at Rothesay exceeds or falls short of that at the other Stations.

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* These names are applied to the physical divisions of the Clyde Sea Area, as described in Dr Mill's paper already cited.

TABLE—*Comparing Mean Monthly Temperatures of Surface Water at 9 a.m. at Rothesay and the undernoted Stations.*

Date.	Ardrishaig.	Brodick.	Stranraer.	Oxcar.	Bell Rock.	Stornoway.	Invergordon.
1890.							
January .	...	...	...	+0·9	+0·6	...	...
February .	+0·4	...	...	+1·0	+0·3	...	+1·5
March . .	−0·1	...	...	+1·1	+1·7	...	...
April . .	−0·6	−0·5	...	+0·3	+1·1	+0·2	...
May . .	−0·2	−1·3	...	−0·7	+0·5	−1·0	...
September .	+0·5	...	...	...	+0·3	...	−0·2
October .	+1·0	+0·6	...	+3·8	+0·4	...	+2·3
November .	+1·1	+0·5	...	+3·1	+0·7	...	+0·9
December .	+2·1	+0·6	...	...	+1·0	...	+3·5
1891.							
January .	+2·4	+1·0	+3·5	+3·6	+2·2	...	+3·6
February .	−1·1	−0·8	−0·4	...	+0·5	...	+0·9
March . .	−0·1	...	+0·8	+1·3	+1·0	...	+0·3
April . .	−0·1	+0·2	+0·6	+1·1	...	...	+0·2
May . .	−1·1	−1·4	−2·3	−0·6	...	−1·4	...
September .	...	−0·3	−0·9	−0·6	−0·2	...	+0·1
October .	+0·9	+0·3	+1·0	+0·5	+0·2	...	+2·1
November .	+1·6	+0·8	+3·1	+2·4	+1·3	...	...
December .	−0·7	−1·1	+1·9	+1·7	+0·6	...	+1·0
1892.							
March . .	+0·1	−0·4	+1·5	+1·9	+1·0	...	...
April . .	−1·0	−0·3	−1·2	+1·2	+1·3	...	...
June . .	+0·4	+0·5	−1·7	+1·0	+2·5	+2·2	...
September .	−0·5	−0·2	−0·4	+0·6	+0·1	...	...
October .	+1·1	+0·7	+3·1	+1·6	+0·5	...	+1·3
November .	+1·0	+0·6	+2·4	+2·2	+1·5	...	...
December .	−0·1	−0·3	+2·8	+1·7	+0·9	...	+1·0

+ means that the temperature at Rothesay was higher than that at other Stations.
− that it was lower.

From February to May in each year Rothesay Bay was colder by half a degree or more than Ardrishaig or Brodick. In September it was about the same temperature, and from October to January it was, speaking generally, considerably warmer, usually by a degree or more. With one or two very small exceptions the water at Rothesay was warmer during the whole time of observation than that on the East Coast. From November to January it averaged about 2°·5 warmer at Rothesay than at Oxcar, and 1°·5 warmer than at the Bell Rock. The difference was least at the time of the annual maximum in September, showing that the West Coast differs by being warmer in winter (rather than in summer) than the East Coast.

Fairlie Roads.—The anchorage was in from 7 to 12 fathoms, and the observations should be of use as indicating the temperature of the eastern side of the Arran Basin, which is much shallower and more exposed to the prevailing south-westerly wind than the eastern side. The winter observations showed that the temperature was somewhat lower off Fairlie than in Rothesay Bay at the same time. There was less difference between the two in summer. The days on which both forenoon and afternoon observations were made showed practically no change of temperature due to sun-heating.

Off Greenock.—The depth of the anchorage was from 7 to 15 fathoms and the position in the estuary of the Clyde, where the deep water of the Dunoon Basin has shallowed at its meeting with the river. The position of Greenock in the estuary of the Clyde corresponds physically with that of Oxcar at the end of the estuary of the Forth. A considerable range of temperature between surface and bottom was found on almost every occasion; the fresher river water tending to resist the mixture which rapidly equalises the temperature of water of uniform salinity when exposed to tide and wind. The range between morning and afternoon was also greater than at other Stations, an effect probably due to the same cause. The highest temperature observed was 13°·0 on 30th September 1890, which was the only September represented in the record. No observations were taken at this place from June to September inclusive, so that the record is practically one of the winter months alone. The lowest temperature noted was 5°·4 on 1st March 1890, at the surface, the reading at 5 fathoms, being 6°·5, and at the bottom (9 fathoms) 6°·8, a typical distribution for early spring.

Oban Bay.—There are a few summer observations from Oban Bay, from 27th June to 12th July 1887, and 5th June to 28th, 1889. The depths ranged from 11 to 20 fathoms. In June to July 1887, the whole mass of water was practically at the same temperature, showing a gradual warming from 11°·2 to 12°·3. In June 1889, on the other hand, the surface varied from 9°·8 to 13°·7, while the deeper water warmed up uniformly from 9°·0 to 11°·3, showing a gradually increasing vertical range.

Castle Bay, Barra, and Vatersay Bay.—These are characteristic Stations of the Outer Hebrides, showing the effect of the North Atlantic water on first reaching land. The anchorages, unfortunately, were rather shallow, averaging about 7 fathoms, but probably pretty free from local disturbance. In June 1887 the temperature averaged about quarter of a degree higher throughout its whole depth than that at Oban Bay at a later date in the same month. The record takes account of the greater part of June in 1887, 1888, and 1891, the means for the 9 A.M. observations being respectively 11°·8, 12°·0, and 11°·2, 1891 being distinctly colder than the other Junes. The latter part of May 1889 had the mean temperature 10°·0, and the same period of 1891 was 9°·2. These temperatures are, in all cases, higher than those prevailing at the same time in the sheltered water of the Clyde Sea Area.

Stornoway Loch (Lewis).—This harbour is useful as an indication of the condition of the water in the Minch. The depth at the anchorage was from 6 to 10 fathoms. Observations were made in June, November, and December 1887, January, April, May, June, and July 1888, May and June 1889, April, May, and June 1890, May, June, and July 1891, and May, June, and July 1892. There are thus sufficient data for the early summer conditions of the various years being compared with confidence. The mean monthly temperatures for 1890, 1891, 1892, as compared in the accompanying Table, shows that Stornoway Harbour was practically at all times colder by about 1°·0 than the water at the Stations in the Clyde Sea Area, and always warmer by about 1°·0 than the water at the Bell Rock on the East Coast. Stornoway was colder than the Firth of Forth at Oxcar, except in April and May 1890, and in May 1891.

TABLE—*Comparing Mean Monthly Temperatures of Surface Water at 9 a.m. at Stornoway and at the Undernoted Stations.*

Date.	Ardrishaig.	Brodick.	Stranraer.	Oxcar.	Bell Rock.	Invergordon.
1890.						
April, .	−0·8	−0·7	...	+0·1	+0·9	...
May, .	−1·0	−0·3	...	+0·3	+1·5	...
June, .	−0·6	−0·9	...	−0·3	+0·7	...
1891.						
May, .	+0·3	...	−0·9	+0·8	+1·4	...
June, .	−1·0	+0·8	−2·4	−0·3	+2·0	...
July, .	−1·4	−0·8	−3·9	−2·6	+0·1	...
1892.						
May, .	−1·4	−0·1	−2·2	−0·1	+1·4	...
June, .	−1·4	−1·3	−3·5	−0·8	+0·7	...
July, .	−2·0	−2·3	−4·4	−1·4	−0·6	−2·4

+ means that the temperature at Stornoway was higher than that of other Stations.
− that it was lower.

The difference of temperature in 1892 was very remarkable. For the three months, May to July, Stornoway averaged 1°·5 colder than Ardrishaig or Brodick, and 3°·5 colder than Loch Ryan at Stranraer.

Kirkwall Bay.—This bay on the north coast of the mainland of Orkney should serve as a connecting link between the thermal conditions of the Atlantic and the North Sea. The anchorage was, unfortunately, not deep enough to give quite satisfactory results, being only between 6 and 7 fathoms. The temperature was always the same from surface to bottom.

The mean monthly temperature of the surface water at Kirkwall during September in 1889 was 10°·3. Comparing with the West Coast Stations, that of Campbeltown was 11°·5, Rothesay 11°·7; and with East Coast Stations, Abertay was 12°·8, Invergordon 12°·9. For the same month in 1891, the Kirkwall mean was 12°·3, the same as Rothesay and Ardrishaig, while Brodick was 12°·6, and West Loch Tarbert 14·1°, Invergordon was 12°·2, Abertay and Bell Rock 12°·5, and Oxcar 12°·9.

In the month of October, the mean for 1890 at Kirkwall was 11°·2, that of Ardrishaig 11°·0, Brodick 11°·4, Rothesay 12°·0, Campbeltown 12°·2, Oban 8°·2, Invergordon 9°·7, Abertay 11°·1, Bell Rock 11°·6.

Thus, in September, the water at Kirkwall is usually colder than at the other Stations, but by October some of the East Coast Stations begin to show a lower mean, which is more marked as the winter advances.

Considering winter monthly means, these can be calculated for Kirkwall in November and January 1891, and February 1890. In November 1891 the mean surface temperature at Kirkwall was 8°·0, and all Stations except Bell Rock (7°·7), West Loch Tarbet (7°·6), and Stranraer (7°·0) were higher; Rothesay as much as 2°·1.

In January (1891) all West Coast Stations were warmer than Kirkwall (5°·4), except Ardrishaig (5°·1); and the East Coast Stations were lower, except North Carr, which was the same, the Bell Rock being also nearly the same (5°·3).

In February, considering 1890 records, Kirkwall 5°·7, was still colder than West Coast Stations (Rothesay 8°·0), except Ardrishaig (5°·6), the same as the Bell Rock, and warmer than other East Coast Stations,—Invergordon 4°·5, Oxcar 5°·0, Abertay 5°·2, North Carr 5°·6.

The September maximum and the February minimum are thus, as might be expected, less extreme at Kirkwall than on the East Coast.

Wick Bay, exposed to the easterly winds on the North Sea, is represented by a few observations in from 6 to 7 fathoms of water, made mainly in the latter part of August 1887 and the beginning of August 1888. The variation of temperature with depth is very slight—from nothing to half a degree. There are few figures available for comparison, but, in August 1887, the mean surface temperature of the water at 9 A.M. at Wick was 12°·2, at Invergordon it was 14°·0, and at Oban 13°·8. In July 1892 the mean at Wick was 11°·2, at Stornoway 9°·9, at Invergordon 12°·3.

Off Invergordon, Cromarty Firth.—The physical conditions of this somewhat remarkable East Coast Firth have been discussed fully in an earlier Report (for 1887, p. 320). Its main peculiarity is that the tongue of comparatively deep water runs far into the land, shoaling gradually, and not cut off from the rest of the Moray Firth by any bar or bank. The average depth at the anchorage was 13 fathoms. The following Table, comparing the temperature of the surface water at 9 A.M., shows that, at Invergordon, the temperature was almost always lower than at the West Coast Stations, except sometimes during winter when great cooling was always experienced in the shallow Loch Ryan.

TABLE—*Comparing Mean Monthly Temperature of Surface Water at 9 a.m. at Invergordon and at the Undernoted Stations.*

Date.	Ardrishaig.	Brodick.	Stranraer.	Oxcar.	Bell Rock.
1890.					
February, .	−1·1	...	...	−0·5	−1·2
July, .	+1·5	+0·7	...	+2·4	+1·6
August, .	−0·2	−0·6	...	+1·8	+0·4
September,	+0·7	+0·2	...	...	+0·5
October, .	−1·3	−1·7	...	+1·5	−0·9
November,	+0·2	−0·4	...	+2·2	−0·2
December,	−1·4	−2·9	...	...	−2·5
1891.					
January, .	−1·2	−2·6	−0·7	...	−1·4
February, .	−2·0	−1·7	−2·5	...	−0·4
March, .	−0·4	−0·3	−1·6	+1·2	+0·7
April, .	−0·3	...	+0·4	+0·9	...
September,	−0·1	−0·4	−1·0	−0·7	−0·3
October, .	−1·2	−1·8	−1·1	−1·6	−1·9
December,	−1·7	−2·1	+0·9	+0·7	−0·4
1892.					
February, .	−3·5	−3·2	−1·5	−1·3	−2·2
July, .	+0·4	+0·1	−2·0	+1·0	+1·8
August, .	+2·0	+1·5	−0·5	+1·8	+2·9
October, .	−0·4	−0·6	+1·3	+0·3	−0·8
December,	−1·1	−1·3	+1·8	+0·7	−0·1

+ means that the temperature at Invergordon was higher than that of other Stations.
− that it was lower.

The Cromarty Firth water was, however, considerably warmer than that at Oxcar, in the Firth of Forth, except on a very few occasions. It was usually warmer than the Bell Rock in summer and colder in winter, showing, as might be expected, a greater dependence on the air temperature, due to its greater proximity to land.

In conclusion, we thank Messrs W. S. Bruce and J. Crystal Bell, who have reduced all the specific gravity readings and determined the salinities, and calculated the means published in the Tables; and also Mr T. R. Marr who drew one of the figures.

8.—PHYSICAL OBSERVATIONS, 1891.

I. FIXED STATIONS.

TABLE I.—Temperature of Water—Abertay Light Vessel.

Ten-day Period.	Observations, 9 A.M.						Observations, 3 P.M.					
	Air.	Surf.	1 fm.	3 fms.	5 fms.	Bot.	Air.	Surf.	1 fm.	3 fms.	5 fms.	Bot.
1891.												
Apr. 1–10	4·8	4·2	4·4	4·4	4·4	4·4	6·9	4·5	4·5	4·5	4·6	4·6
,, 11–20	9·4	5·3	5·2	5·2	5·1	5·1	9·0	5·6	5·5	5·5	5·4	5·4
,, 21–30	7·6	6·7	6·7	6·6	6·6	6·5	9·5	6·7	6·2	6·1	6·1	6·0
May 1–10	8·9	7·3	7·2	7·1	7·0	6·9	10·0	7·4	7·2	7·0	7·0	6·8
,, 11–20	10·3	7·5	7·3	7·4	7·3	7·3	11·4	7·8	7·7	7·6	7·5	7·5
,, 21–31	10·4	8·7	...	8·4	...	8·3	11·3	8·6	...	8·3	...	8·2
June 1–10	10·7	9·1	...	9·3	...	9·3	12·6	9·4	...	9·3	...	9·3
,, 11–20	13·6	10·3	...	9·7	...	9·7	15·6	11·6	...	10·6	...	10·5
,, 21–30	15·7	11·8	...	11·8	...	11·5	15·7	11·8	...	11·5	...	11·9
July 1–10	15·6	11·5	...	12·3	...	11·9	18·4	11·2	...	11·8	...	11·6
,, 11–20	16·0	13·1	...	12·5	...	12·3	18·3	14·0	...	13·6	...	13·1
,, 21–31	14·3	12·9	...	12·8	...	12·7	16·9	12·6	...	12·4	...	12·4
Aug. 1–10	15·1	13·2	...	13·2	...	12·9	16·9	12·9	...	12·6	...	12·6
,, 11–20	13·9	13·5	...	13·1	...	13·0	17·7	13·8	...	13·5	...	13·2
,, 21–31	14·4	13·1	...	13·1	...	13·1	15·3	13·4	...	13·2	...	13·1
Sept. 1–10	13·0	12·8	...	12·8	...	12·7	15·3	13·0	...	12·7	...	12·6
,, 11–20	14·8	13·0	...	12·9	...	12·8	16·1	13·3	...	13·0	...	12·8
,, 21–30	12·2	11·7	...	11·7	...	11·7	13·9	11·9	...	11·6	...	11·6
Oct. 1–10	11·0	11·4	...	11·5	...	11·6	14·8	11·7	...	11·7	...	11·7
,, 11–20	9·2	10·2	...	10·6	...	10·7	11·0	10·8	...	11·0	...	11·2
,, 21–31	7·2	9·4	...	10·1	...	10·2	10·4	9·6	...	10·4	...	10·4
Nov. 1–10	7·4	9·0	...	9·4	...	9·6	8·5	9·6	...	10·0	...	9·9
,, 11–20	6·8	7·6	...	8·3	...	8·7	8·6	8·8	...	9·3	...	9·3
,, 21–30	4·0	7·4	...	8·4	...	8·8	4·9	7·6	...	8·6	...	8·9
Dec. 1–10	6·2	6·7	...	7·5	...	7·6	7·6	7·4	...	8·2	...	8·3
,, 11–20	3·1	5·7	...	6·7	...	6·8	4·9	6·7	...	7·3	...	7·5
,, 21–31	3·5	5·9	...	7·1	...	7·3	4·5	5·8	...	7·0	...	7·2

TABLE II.—Temperature of Water—Abertay Light Vessel.

Monthly Means.

Month.	Observations, 9 A.M.						Observations, 3 P.M.					
	Air.	Surf.	1 fm.	3 fms.	5 fms.	Bot.	Air.	Surf.	1 fm.	3 fms.	5 fms.	Bot.
1891.												
April	7·3	5·4	5·4	5·4	5·4	5·3	8·5	5·6	5·4	5·4	5·4	5·3
May	9·9	7·9	7·2	7·6	7·1	7·5	10·9	7·9	7·4	7·6	7·2	7·5
June	13·3	10·4	...	10·3	...	10·2	14·6	10·9	...	10·5	...	10·5
July	15·3	12·5	...	12·5	...	12·3	17·9	12·6	...	12·6	...	12·4
August	14·5	13·3	...	13·1	...	13·0	16·6	13·4	...	13·1	...	13·0
September	13·3	12·5	...	12·5	...	12·4	15·1	12·7	...	12·4	...	12·3
October	9·1	10·3	...	10·7	...	10·8	12·1	10·7	...	11·0	...	11·1
November	6·1	8·0	...	8·7	...	9·0	7·3	8·7	...	9·3	...	9·4
December	4·3	6·1	...	7·1	...	7·2	5·7	6·6	...	7·5	...	7·7

TABLE III.—TEMPERATURE OF WATER—NORTH CARR ROCK LIGHT VESSEL.

Ten-day Period.	Observations, 9 A.M.				Observations, 3 P.M.			
	Air.	Surf.	12 fms.	Bot. 24 fms.	Air.	Surf.	12 fms.	Bot. 24 fms.
1891.								
Apr. 1–10	8·9	4·7	4·8	4·9	5·6	4·8	4·9	4·8
,, 11–20	7·0	5·5	5·6	5·2	8·6	5·9	6·0	5·1
,, 21–30	9·5	6·2	6·6	5·7	8·4	6·4	6·7	6·0
May 1–10	6·6	6·6	6·3	5·8	7·9	6·8	6·3	5·7
,, 11–20	7·6	7·7	7·6	6·6	11·9	7·6	7·7	7·1
,, 21–31	8·2	8·3	7·8	7·1	8·7	8·6	8·4	7·2
June 1–10	11·0	9·0	9·0	8·7	11·1	9·7	9·5	8·6
,, 11–20	13·4	10·2	10·3	8·6	14·5	10·4	10·9	8·6
,, 21–30	15·6	12·0	11·9	12·7	15·4	11·5	12·0	12·8
July 1–10	15·3	12·0	12·4	16·0	15·6	12·7	12·3	14·7
,, 11–20	17·2	12·9	13·0	12·4	15·0	13·4	13·2	12·4
,, 21–31	14·7	12·2	12·8	12·6	15·1	13·0	13·0	13·3
Aug. 1–10	14·0	12·3	13·0	12·4	16·3	12·8	13·6	12·3
,, 11–20	14·6	12·4	13·2	12·7	16·8	12·8	13·5	12·7
,, 21–31	13·0	12·3	13·3	12·5	13·4	12·5	13·5	12·6
Sept. 1–10	14·9	12·4	13·2	11·9	17·4	12·7	13·7	12·2
,, 11–20	16·1	12·5	13·1	12·6	17·3	13·0	13·4	12·7
,, 21–30	12·5	11·6	12·3	11·7	14·4	11·9	12·6	11·9
Oct. 1–10	12·9	11·0	11·7	11·9	13·7	11·4	11·9	12·1
,, 11–20	10·2	9·9	10·2	11·1	12·2	10·1	10·1	11·2
,, 21–31	9·0	9·8	10·4	10·9	10·7	9·7	10·2	10·7
Nov. 1–10	9·6	9·4	9·1	10·0	10·0	9·6	9·4	10·1
,, 11–20	8·7	9·0	9·0	9·7	11·0	9·3	9·1	9·1
,, 21–30	4·9	7·6	8·4	8·4	6·4	7·9	8·9	8·7
Dec. 1–10	7·9	7·9	8·4	8·6	8·3	7·7	8·5	8·6
,, 11–20	4·0	6·8	7·7	8·0	5·0	5·9	7·5	8·0
,, 21–31	4·4	6·2	7·4	7·8	5·4	6·3	7·4	7·6

TABLE IV.—TEMPERATURE OF WATER—NORTH CARR ROCK LIGHT VESSEL.

Monthly Means.

Month.	Observations, 9 A.M.				Observations, 3 P.M.			
	Air.	Surface.	12 fms.	Bottom 24 fms.	Air.	Surface.	12 fms.	Bottom. 24 fms.
1891.								
April	8·5	5·5	5·7	5·3	7·5	5·7	5·8	5·3
May	7·5	7·5	7·2	6·5	9·5	7·7	7·5	6·7
June	13·3	10·4	10·4	10·0	13·7	10·5	10·8	10·0
July	15·7	12·4	12·7	13·7	15·2	13·0	12·8	13·5
August	13·9	12·3	13·2	12·1	15·5	12·7	13·5	12·5
September	14·5	12·2	12·9	12·1	16·4	12·5	13·2	12·3
October	10·7	10·3	10·8	11·3	12·2	10·4	10·7	11·3
November	7·7	8·7	8·9	9·4	9·1	8·9	9·1	9·3
December	5·4	7·0	7·8	8·1	6·2	6·6	7·8	8·1

TABLE V.—TEMPERATURE OF WATER—OXCAR, BELL ROCK, AND DUNBAR.

Ten-day Period.	1. OXCAR Lighthouse.				2. BELL ROCK Lighthouse.				3. DUNBAR HARBOUR.			
	9 A.M.		3 P.M.		9 A.M.		3 P.M.		9 A.M.		4 P.M.	
	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Bot.	Air.	Bot.
1891.												
Apr. 1–10	6·3	4·8	5·6	4·7	...	...	...	...	...	...	...	...
,, 11–20	10·5	6·0	15·4	8·1	...	...	...	...	...	...	...	...
,, 21–30	9·3	7·2	10·7	7·6	...	...	...	...	...	...	...	...
May 1–10	9·4	6·9	11·0	8·0	...	...	...	...	...	...	...	...
,, 11–20	11·2	8·6	11·9	9·0	...	...	...	...	...	...	...	...
,, 21–31	9·9	9·0	10·9	9·2	8·9	7·6	10·3	7·6	...	...	...	...
June 1–10	9·7	10·0	11·0	10·6	10·2	8·5	9·1	8·4	...	...	...	...
,, 11–20	13·4	11·2	13·3	12·0	14·3	9·7	16·8	10·2	...	...	...	...
,, 21–30	16·0	14·0	16·0	13·8	14·9	10·1	14·9	10·0	...	...	...	...
July 1–10	17·4	14·9	17·4	14·8	14·6	11·2	16·1	11·0	...	...	...	...
,, 11–20	16·7	14·3	17·9	15·7	16·1	11·6	15·4	11·8	17·5	13·4	18·9	13·0
,, 21–31	14·8	13·8	17·7	14·9	15·1	12·1	15·1	12·0	15·9	13·5	15·5	13·7
Aug. 1–10	17·7	14·3	16·9	14·5	13·5	12·0	16·7	12·0	14·9	12·9	17·6	13·3
,, 11–20	14·6	13·8	17·4	14·8	13·4	12·4	16·2	12·9	15·8	13·0	16·3	13·1
,, 21–31	14·6	14·0	15·8	14·4	13·0	12·7	13·7	12·8	14·7	12·9	15·6	13·1
Sept. 1–10	14·3	13·2	16·8	13·9	14·1	12·8	13·0	12·6	15·9	12·9	21·5	13·7
,, 11–20	15·3	13·7	16·6	13·8	15·2	12·9	14·8	13·0	16·1	13·1	15·9	13·2
,, 21–30	12·5	11·9	14·7	12·9	12·2	11·7	15·0	12·0	14·9	12·2	15·9	12·1
Oct. 1–10	12·3	11·7	14·6	12·4	11·5	11·7	12·8	11·7	12·3	11·5	13·6	12·0
,, 11–20	9·8	10·7	11·0	10·9	8·9	10·8	10·9	11·0	10·4	10·9	9·4	10·6
,, 21–31	6·9	9·3	9·9	9·8	8·7	10·3	8·9	10·4	9·0	9·8	9·3	9·8
Nov. 1–10	6·7	8·7	7·9	9·1	8·1	9·9	8·0	10·0	8·2	9·1	7·9	9·1
,, 11–20	7·0	7·5	7·4	7·6	7·9	9·0	6·9	9·0	7·0	8·8	7·9	8·6
,, 21–30	3·3	7·0	4·4	7·1	4·1	7·5	3·9	8·0	4·6	7·2	6·1	8·0
Dec. 1–10	7·4	7·0	7·2	7·2	7·2	8·0	6·7	8·0	9·7	7·6	7·7	7·7
,, 11–20	3·6	5·8	4·5	6·2	4·7	7·0	...	...	7·2	5·7	3·1	6·5
,, 21–31	3·4	5·0	4·2	5·6	3·7	5·9	...	...	2·9	5·9	5·3	5·8

TABLE VI.—TEMPERATURE OF WATER—OXCAR, BELL ROCK, AND DUNBAR.

Monthly Means.

Month.	OXCAR Lighthouse.				BELL ROCK Lighthouse.				DUNBAR HARBOUR.			
	9 A.M.		3 P.M.		9 A.M.		3 P.M.		9 A.M.		4 P.M.	
	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Bot.	Air	Bot.
1891.												
April	8·7	6·0	10·6	6·8	...	...	...	...	...	...	...	...
May	10·2	8·2	11·3	8·7	8·9	7·6	10·3	7·6	...	...	...	...
June	13·3	11·7	13·4	12·1	13·1	9·4	13·6	9·5	...	...	...	...
July	16·4	14·3	17·7	15·1	15·3	11·6	15·5	11·6	16·7	13·4	17·2	13·3
August	15·6	14·0	16·7	14·6	13·3	12·4	15·5	12·5	15·1	12·9	16·5	13·2
September	14·0	12·9	16·0	13·5	13·8	12·5	14·3	12·5	15·6	12·7	17·8	13·0
October	9·7	10·6	12·0	11·0	9·7	10·9	10·9	11·0	10·5	10·7	10·8	10·8
November	5·7	7·7	6·6	7·9	6·7	8·8	6·2	9·0	6·6	8·4	7·3	8·6
December	4·8	5·9	5·3	6·3	5·2	7·0	6·7	8·0	6·6	6·4	5·4	6·7

TABLE VII.—TEMPERATURE OF WATER—WEST COAST.

Ten-day Period.	1. ARDRISHAIG.				2. BRODICK.		3. W. LOCH TARBERT.			4. LOCH RYAN. STRANRAER.		
	9 A.M.		3 P.M.		10 A.M.	4 P.M.	3 P.M.			9 A.M.		
	Air.	Surf.	Air.	Surf.	Surf.	Surf.	Air.	Surf.	Bot.	Air.	Surf.	Bot.
1891.												
Apr. 1–10	4·7	5·5	6·0	5·7	5·7	6·0	6·5	6·1	6·0	8·3	4·8	5·0
,, 11–20	10·1	7·7	13·7	7·5	7·5	8·0	9·1	7·8	7·7	14·1	6·7	6·8
,, 21–30	10·7	8·5	14·2	8·8	7·5	7·9	9·4	8·7	8·4	15·2	7·9	7·9
May 1–10	10·7	8·6	15·6	9·0	8·3	8·7	11·7	10·6	10·4	14·3	9·0	9·0
,, 11–20	12·1	8·7	15·7	9·0	9·4	10·7	11·5	11·1	10·8	16·8	10·4	10·5
,, 21–31	13·2	8·8	16·1	9·2	9·4	11·0	11·9	10·9	10·7	16·1	10·4	10·4
June 1–10	14·7	10·9	17·2	11·0	9·9	10·5	14·4	12·4	12·3	21·0	12·3	12·2
,, 11–20	17·1	11·8	19·5	12·3	...	...	16·0	14·8	14·7	21·3	13·7	13·5
,, 21–30	19·9	14·5	25·4	15·6	11·4*	11·6*	19·7	16·5	15·6	22·0	15·5	16·0
July 1–10	16·9	14·0	19·6	14·1	12·4	12·7	15·5	15·9	15·6	21·0	15·0	14·8
,, 11–20	17·9	13·9	23·0	14·8	12·0	12·3	18·1	16·9	16·8	23·4†	16·0†	15·9†
,, 21–31	18·3	11·3	21·0	12·2	13·1	13·7	14·7	16·7	16·1	22·4†	15·8†	15·8†
Aug. 1–10	20·1	11·6	20·2	12·1	13·0	13·9	15·5	16·0	15·5	20·5	15·4	15·4
,, 11–20	17·9	11·8	19·5	12·3	12·3	12·4	16·4	15·6	15·0	19·8	15·1	15·0
,, 21–31	16·1	12·5	18·4	13·2	12·5	12·7	14·3	14·5	14·4	17·8	14·4	14·4
Sept. 1–10	14·9	12·4	17·6	12·8	12·5	12·5	15·8	14·7	13·7	17·6	13·5	13·5
,, 11–20	16·7	12·8	18·6	13·1	13·3	13·6	15·5	14·7	14·2	17·3	14·0	14·0
,, 21–30	14·6	11·7	16·0	11·9	12·0	12·3	13·1	12·8	12·8	14·9	12·2	12·1
Oct. 1–10	12·8	11·3	14·7	11·5	11·8	12·1	12·4	11·6	12·0	15·0	11·9	11·9
,, 11–20	9·1	10·0	10·5	10·3	11·1	11·4	9·4	9·7	10·0	12·1	10·0	10·1
,, 21–31	7·6	9·2	9·7	9·4	9·6	10·2	10·1	9·8	10·2	8·8	8·4	8·5
Nov. 1–10	6·3	8·6	9·1	8·8	9·6	9·7	8·3	8·4	8·6	8·5	7·9	7·7
,, 11–20	4·7	8·4	6·2	8·8	9·6	9·8	7·5	7·2	7·4	7·6	7·1	7·1
,, 21–30	4·0	8·6	5·4	8·7	8·7	8·7	5·3	6·1	6·6	6·6	5·9	6·0
Dec. 1–10	5·5	8·6	6·5	8·6	9·3	9·5	7·5	6·7	6·7	8·4	6·6	6·6
,, 11–20	2·6	8·4	2·9	8·0	8·8	8·2	5·4	6·5	6·6	7·1	5·5	5·5
,, 21–31	1·6	7·8	3·4	7·9	7·9	8·0	5·3	5·0	5·6	6·0	5·0	5·2

* Two days only. † Station closed during Naval Manœuvres from 19th to 30th inclusive.

TABLE VIII.—TEMPERATURE OF WATER—WEST COAST.

Monthly Means.

Month.	1. ARDRISHAIG.				2. BRODICK.		3. W. LOCH TARBERT.			4. LOCH RYAN. STRANRAER.		
	9 A.M.		3 P.M.		10 A.M.	4 P.M.	3 P.M.			9 A.M.		
	Air.	Surf.	Air.	Surf.	Surf.	Surf.	Air.	Surf.	Bot.	Air.	Surf.	Bot.
1891.												
April	8·5	7·2	11·3	7·3	6·9	7·3	8·3	7·5	7·4	12·5	6·5	6·6
May	12·0	8·7	15·8	9·1	9·0	10·1	11·7	10·9	10·6	15·7	9·9	10·0
June	17·2	12·4	20·7	13·0	10·6	11·0	16·7	14·6	14·2	21·4	13·8	13·9
July	17·7	13·1	21·2	13·7	12·5	12·9	16·1	16·1	16·2	22·3	15·6	15·5
August	18·0	12·0	19·4	12·5	12·6	13·0	15·4	15·4	15·0	19·4	15·0	14·9
September	15·4	12·3	17·4	12·6	12·6	12·8	14·8	14·1	13·6	16·6	13·2	13·6
October	9·8	10·2	11·6	10·4	10·8	11·2	10·6	10·4	10·7	12·0	10·1	10·2
November	5·0	8·5	6·9	8·8	9·3	9·4	7·0	7·6	7·5	7·6	7·0	6·9
December	3·2	8·3	4·3	8·2	8·7	8·6	6·1	6·1	6·3	7·2	5·7	5·8

TABLE IX.—TEMPERATURE OF WATER—TARBERT AND STRANRAER.

Daily Records.

Date.	West Loch. Tarbert—3 p.m.			Loch Ryan. Stranraer—9 a.m.		
	Surf.	Bot.	Air.	Surf.	Bot.	Air.
1891.						
Apr. 1	6·6	6·2	7·6	5·8	6·0	9·5
,, 2	5·2	5·8	4·6	4·6	4·8	4·5
,, 3	6·0	5·6	4·2	3·0	5·6	...
,, 4	5·8	5·4	6·2	4·8	5·0	7·2
,, 5	...	...	...	6·0	4·8	4·5
,, 6	6·0	6·1	6·2	5·0	5·2	9·5
,, 7	5·6	5·8	5·6	4·0	4·2	...
,, 8	6·6	6·8	8·8	4·8	5·1	11·1
,, 9	6·4	6·5	7·4	4·7	4·1	10·6
,, 10	6·6	6·2	8·0	5·3	5·1	10·0
,, 11	6·8	7·2	10·2	5·4	5·3	11·1
,, 12	...	...	...	3·3	5·4	13·3
,, 13	7·0	6·9	7·4	6·0	6·0	10·6
,, 14	7·2	7·2	8·2	6·0	6·0	10·6
,, 15	7·5	7·4	8·8	7·0	5·2	5·0
,, 16	8·3	8·0	8·7	7·6	7·8	4·5
,, 17	8·7	8·2	10·0	8·0	8·2	13·9
,, 18	8·5	8·2	9·7	8·0	8·1	10·0
,, 19	...	...	...	7·7	7·9	13·9
,, 20	8·6	8·8	10·0	7·8	8·0	14·5
,, 21	7·9	7·6	8·2	7·6	7·2	10·0
,, 22	7·9	7·8	9·0	6·9	7·1	13·3
,, 23	8·4	8·2	10·0	...	...	...
,, 24	8·7	8·6	9·6	7·0	7·2	15·0
,, 25	8·7	8·6	10·4	8·2	8·0	16·1
,, 26	...	...	...	8·2	8·1	16·7
,, 27	9·1	9·0	9·9	7·8	7·8	14·5
,, 28	9·3	9·1	8·0	7·8	8·0	15·6
,, 29	8·9	8·6	7·6	7·8	7·8	12·2
,, 30	9·6	9·3	12·0	8·6	8·6	16·7
May 1	9·8	9·7	10·2	8·8	8·7	13·3
,, 2	9·8	9·0	8·1	8·2	8·0	14·5
,, 3	...	...	...	7·8	7·8	11·1
,, 4	10·6	10·2	11·2	9·2	9·0	16·7
,, 5	10·9	10·4	12·4	9·0	9·0	14·5
,, 6	10·6	10·6	11·4	9·0	9·2	14·5
,, 7	11·2	11·6	13·8	9·2	9·2	15·6
,, 8	10·8	10·7	10·4	9·2	9·6	12·8
,, 9	10·9	10·5	15·0	9·0	9·2	12·2
,, 10	...	...	...	10·4	10·2	17·8
,, 11	11·1	10·7	14·4	10·2	10·0	20·6
,, 12	11·8	11·4	15·2	12·0	12·0	21·2
,, 13	11·8	12·0	12·0	12·6	12·6	15·6
,, 14	12·3	12·0	11·8	11·2	11·4	18·3
,, 15	11·5	11·7	11·2	11·0	11·2	15·6
,, 16	10·6	10·0	8·7	9·2	9·5	13·9
,, 17	...	...	...	10·4	10·6	16·1
,, 18	10·5	10·2	10·2	8·4	8·6	13·9
,, 19	10·5	9·9	10·3	9·6	9·4	15·6
,, 20	10·1	9·7	9·3	9·4	9·4	16·7
,, 21	9·8	9·6	9·6	10·6	10·4	17·8
,, 22	10·3	9·9	12·1	10·2	10·0	17·2
,, 23	10·8	10·9	13·2	11·2	11·0	18·3
,, 24	...	...	...	9·6	9·8	13·9
,, 25	10·9	10·6	11·8	10·1	10·0	17·2
,, 26	10·9	10·6	11·5	9·8	10·0	13·9
,, 27	11·6	11·6	13·0	10·0	10·2	14·5
,, 28	11·4	11·2	11·5	10·6	10·8	14·5
,, 29	10·9	10·6	11·9	10·4	10·4	14·5
,, 30	11·5	11·4	12·1	10·6	10·6	20·0
,, 31	...	...	...	10·4	10·6	15·6
June 1	12·1	11·8	16·2	12·4	12·2	22·1
,, 2	11·9	12·5	13·3	12·0	12·0	17·2
,, 3	12·1	12·0	16·0	12·6	12·4	22·8
,, 4	12·2	12·2	14·8	12·2	12·3	20·0
,, 5	12·5	12·3	13·2	11·4	11·4	19·5
,, 6	12·5	12·1	13·4	12·1	12·0	20·6
,, 7	...	...	...	12·6	12·4	22·8
,, 8	12·2	12·0	13·1	12·4	12·2	20·6
,, 9	13·0	12·6	15·0	12·6	12·4	22·8
,, 10	13·2	12·8	14·4	12·6	12·4	21·1
,, 11	13·2	13·0	15·8	12·5	12·4	22·2
1891.						
June 12	14·6	14·4	15·0	12·8	12·6	22·2
,, 13	14·7	14·4	12·8	13·2	13·0	19·5
,, 14	...	...	...	12·9	12·8	20·6
,, 15	14·4	14·6	13·8	14·0	13·8	22·2
,, 16	14·8	14·6	15·2	13·8	13·8	21·1
,, 17	15·0	14·9	15·6	14·2	14·0	19·5
,, 18	14·9	14·8	15·2	14·0	13·8	21·1
,, 19	15·2	15·0	19·6	14·8	14·6	22·2
,, 20	16·8	16·2	20·6	14·8	14·6	21·1
,, 21	...	...	...	15·8	15·6	23·3
,, 22	15·0	14·4	21·6	15·2	15·0	21·1
,, 23	15·6	15·6	24·0	16·7	16·6	23·3
,, 24	15·0	15·2	21·0	16·4	16·4	22·2
,, 25	16·2	15·0	21·2	17·0	17·0	22·8
,, 26	16·2	15·8	20·4	16·8	16·8	22·2
,, 27	16·6	16·2	18·6	16·2	16·0	21·1
,, 28	...	...	...	15·9	15·9	21·7
,, 29	15·4	15·1	15·0	15·2	15·2	20·0
,, 30	16·2	16·1	15·6	15·4	15 3	21·1
July 1	16·3	15·9	17·6	14·6	14·4	18·3
,, 2	16·5	16·2	15·6	14·7	14·6	20·0
,, 3	15·6	15·1	15·8	14·2	14·0	20·6
,, 4	16·2	16·0	15·6	14·8	14·6	21·1
,, 5	...	...	...	15·2	15·4	22·2
,, 6	16·3	16·2	13·2	16·4	15·2	21·1
,, 7	15·0	14·3	13·8	14·6	14·4	20·6
,, 8	15·7	15·6	14·7	15·2	15·0	21·1
,, 9	15·4	15·2	16·6	15·4	15·3	22·2
,, 10	16·0	15·8	16·6	15·4	15·4	22·2
,, 11	16·3	16·2	15·4	15·6	15·5	22·2
,, 12	...	...	...	15·8	15·6	22·8
,, 13	17·0	16·6	17·2	16·0	15·8	23·3
,, 14	17·0	16·6	19·4	16·0	15·9	23·3
,, 15	17·3	16·8	24·5	16·4	16·2	23·9
,, 16	17·0	16·2	15·4	16·4	16·2	23·9
,, 17	17·5	17·2	18·2	...	...	...
,, 18	17·6	17·5	18·4	...	...	...
,, 19	...	...	...	...	...	...
,, 20	17·3	17·0	16·4	...	...	...
,, 21	17·2	17·0	16·6	...	...	...
,, 22	17·0	16·4	15·8	...	...	...
,, 23	17·3	17·0	15·9	...	...	*...
,, 24	17·0	16·8	15·2	...	...	...
,, 25	16·8	16·5	14·6	...	...	...
,, 26	...	...	...	...	...	...
,, 27	16·4	16·0	13·2	...	...	...
,, 28	15·4	15·4	12·6	...	...	...
,, 29	15·8	15·4	13·4	...	...	...
,, 30	16·0	15·6	15·2	...	...	...
,, 31	16·0	15·6	14·4	15·8	15·8	22·2
Aug. 1	16·3	16·2	16·2	15·8	15·7	22·2
,, 2	...	...	...	15·4	15·6	21·1
,, 3	16·6	16·2	15·0	15·4	15·6	20·6
,, 4	16·6	15·8	17·2	15·6	15·5	21·1
,, 5	16·0	15·4	17·4	15·3	15·4	20·0
,, 6	15·3	14·7	14·0	15·0	15·2	18·3
,, 7	15·3	15·0	15·0	15·4	15·4	20·6
,, 8	15·3	15·3	15·3	15·4	15·2	21·1
,, 9	...	...	...	15·2	15·2	20·0
,, 10	16·4	15·4	15·4	15·0	14·9	19·5
,, 11	16·3	15·4	15·4	15·0	15·0	20·0
,, 12	15·8	15·1	15·1	15·0	15·0	20·0
,, 13	15·0	14·6	14·6	15·0	14·8	19·5
,, 14	15·4	15·3	15·3	15·2	15·1	20·6
,, 15	15·8	15·2	15·2	15·3	15·1	20·6
,, 16	...	...	...	14·8	14·6	19·5
,, 17	15·2	15·0	15·0	14·6	14·5	18·3
,, 18	16·0	15·2	15·2	15·2	15·2	20·0
,, 19	15·2	14·6	14·6	15·2	15·1	18·9
,, 20	15·8	14·6	14·6	15·3	15·2	20·0
,, 21	15·1	14·4	14·4	15·1	15·0	19·5
,, 22	14·4	14·5	14·5	14·8	14·8	17·8

* Station closed during Naval Manœuvres.

TABLE IX.—TEMPERATURE OF WATER—*continued.*

Daily Records.

Date.	WEST LOCH. TARBERT—3 P.M.			LOCH RYAN. STRANRAER—9 A.M.		
	Surf.	Bot.	Air.	Surf.	Bot.	Air.
1891.						
Aug. 23	...	...	...	14·9	14·8	18·3
,, 24	14·6	14·6	14·6	14·7	14·6	17·8
,, 25	14·3	14·3	14·3	14·6	14·6	17·8
,, 26	14·3	14·1	14·1	14·3	14·4	18·3
,, 27	14·0	14·2	14·2	14·2	14·2	19·5
,, 28	13·9	14·0	14·0	14·2	14·2	18·3
,, 29	15·2	14·9	14·9	14·0	14·2	18·3
,, 30	...	...	...	13·8	13·8	17·8
,, 31	14·4	14·4	14·4	13·8	14·6	16·7
Sept. 1	14·2	14·0	13·2	13·8	13·8	16·1
,, 2	13·2	13·2	13·4	13·2	13·2	17·8
,, 3	14·1	13·9	14·4	13·3	13·2	17·8
,, 4	15·3	14·8	16·0	13·2	13·2	17·2
,, 5	14·0	13·6	13·8	13·4	13·2	18·3
,, 6	...	...	...	13·2	13·0	17·2
,, 7	14·0	13·7	14·6	13·3	13·2	18·3
,, 8	13·4	13·0	12·8	13·8	14·0	15·0
,, 9	14·1	13·6	15·0	13·4	13·4	17·8
,, 10	14·3	14·4	18·8	14·6	14·4	20·0
,, 11	14·8	15·1	19·1	14·2	14·2	18·9
,, 12	16·2	15·4	19·8	14·8	14·6	20·0
,, 13	...	...	...	14·2	14·2	17·2
,, 14	15·0	13·8	13·2	14·4	14·4	15·6
,, 15	14·4	13·6	13·6	14·0	14·0	17·2
,, 16	14·1	14·2	14·6	13·4	13·4	15·0
,, 17	14·2	13·8	14·4	13·8	13·8	16·7
,, 18	14·3	14·0	14·6	14·2	14·0	17·2
,, 19	14·3	14·0	14·6	13·8	13·8	16·7
,, 20	...	...	...	13·2	13·2	18·9
,, 21	13·0	12·8	10·6	13·0	13·0	14·5
,, 22	13·2	13·0	13·2	11·0	11·0	14·5
,, 23	13·2	13·2	13·8	12·2	12·2	15·0
,, 24	13·4	13·1	14·0	12·2	12·2	12·8
,, 25	13·2	13·0	13·1	12·4	12·4	15·0
,, 26	13·1	13·0	13·0	12·0	12·0	16·7
,, 27	...	...	...	12·1	12·0	15·6
,, 28	12·2	12·6	14·2	12·4	12·2	15·6
,, 29	12·2	12·4	13·4	12·2	12·0	15·0
,, 30	12·0	12·2	12·6	12·2	12·0	13·9
Oct. 1	12·2	12·0	12·2	12·4	12·4	16·1
,, 2	12·6	12·4	12·8	11·8	11·8	15·0
,, 3	11·8	12·2	13·1	12·0	12·0	15·6
,, 4	...	...	...	12·4	12·4	16·1
,, 5	12·0	12·1	13·0	12·2	12·1	15·6
,, 6	12·0	12·1	12·4	12·2	12·2	15·0
,, 7	11·0	11·3	12·2	12·0	12·0	15·6
,, 8	10·8	11·0	12·0	11·4	11·4	13·9
,, 9	11·0	11·2	12·1	11·6	11·5	14·5
,, 10	11·0	11·2	12·1	11·0	11·1	12·8
,, 11	...	...	...	11·2	11·2	13·3
,, 12	10·9	11·4	10·4	10·4	10·6	12·2
,, 13	11·0	11·1	9·4	10·2	10·3	13·3
,, 14	9·0	9·0	8·4	9·6	9·6	12·8
,, 15	10·0	10·1	10·0	10·0	10·0	12·8
,, 16	9·0	9·4	8·8	10·0	10·0	13·9
,, 17	9·0	9·2	9·0	9·6	9·7	10·0
,, 18	...	...	...	9·6	9·7	11·1
,, 19	9·4	9·4	8·0	9·6	9·6	10·6
,, 20	9·1	10·2	11·0	9·8	9·8	11·7
,, 21	9·2	9·8	10·8	9·8	9·7	12·2
,, 22	9·8	10·9	11·8	9·7	9·7	12·2
,, 23	10·3	10·8	10·4	9·6	9·6	9·5
,, 24	9·2	10·2	9·0	9·6	9·6	10·0
,, 25	...	...	...	8·6	9·0	7·2
,, 26	10·8	10·6	9·8	7·4	7·6	8·9
,, 27	10·5	10·6	9·8	7·6	7·8	9·5
1891.						
Oct. 28	10·1	9·9	9·6	7·4	8·0	8·3
,, 29	9·8	9·6	9·8	7·0	7·4	6·7
,, 30	9·2	9·1	8·7	7·6	8·0	6·7
,, 31	8·7	8·7	7·7	7·6	7·6	6·1
Nov. 1	...	...	...	7·6	7·6	8·3
,, 2	8·9	9·0	9·4	7·8	7·6	8·9
,, 3	9·0	9·2	9·2	8·0	7·6	10·0
,, 4	9·2	9·0	8·4	8·0	8·0	10·0
,, 5	8·8	8·9	8·2	8·0	7·6	8·9
,, 6	7·6	8·4	7·6	8·0	7·6	8·9
,, 7	8·8	9·2	9·7	8·2	8·2	8·3
,, 8	...	...	...	8·0	8·0	7·8
,, 9	7·2	7·4	7·2	8·0	7·4	7·2
,, 10	7·7	7·6	6·4	7·3	7·3	6·7
,, 11	7·2	7·1	6·2	8·1	8·1	7·8
,, 12	7·1	7·2	7·8	6·7	6·8	7·2
,, 13	7·2	7·4	7·8	7·1	7·2	7·8
,, 14	7·2	7·2	7·9	7·0	7·1	7·8
,, 15	...	...	...	7·0	7·0	7·8
,, 16	7·4	7·6	7·2	6·6	6·8	6·1
,, 17	7·4	7·8	6·6	7·0	6·7	7·8
,, 18	7·0	7·2	7·2	6·8	6·8	6·7
,, 19	7·2	7·4	8·8	7·2	7·3	8·9
,, 20	7·2	7·4	7·8	7·0	7·1	7·8
,, 21	6·8	6·6	5·2	6·4	6·4	7·8
,, 22	...	...	...	6·5	6·4	7·2
,, 23	7·4	7·1	6·4	6·3	6·3	5·6
,, 24	6·2	7·4	4·4	6·4	6·5	6·7
,, 25	5·3	5·8	4·8	6·2	6·2	6·7
,, 26	5·2	4·8	2·8	6·0	6·1	6·1
,, 27	6·3	6·4	3·8	4·6	5·0	4·5
,, 28	6·0	7·0	7·2	5·0	5·2	6·1
,, 29	...	...	...	5·3	5·3	6·7
,, 30	5·6	7·0	7·6	6·4	6·8	8·9
Dec. 1	6·9	7·4	9·4	6·5	6·8	9·5
,, 2	6·9	7·2	6·6	6·4	6·6	7·2
,, 3	6·5	7·1	10·4	6·8	6·8	9·5
,, 4	7·4	7·4	8·4	6·9	6·8	10·0
,, 5	7·5	7·4	7·8	7·0	7·0	10·6
,, 6	...	...	...	6·8	6·9	8·9
,, 7	7·2	6·4	4·6	6·4	6·5	6·1
,, 8	7·3	7·2	7·5	6·4	6·4	7·2
,, 9	6·9	6·8	7·0	6·4	6·4	7·8
,, 10	5·6	5·4	5·8	6·3	6·2	7·8
,, 11	5·9	5·8	3·8	5·3	5·4	6·1
,, 12	4·8	6·4	3·6	5·6	5·6	5·0
,, 13	...	...	...	5·6	5·5	6·1
,, 14	6·1	6·2	5·2	5·7	5·6	6·7
,, 15	6·9	6·4	4·4	5·3	5·4	6·1
,, 16	7·2	7·1	6·2	5·5	5·4	8·3
,, 17	6·9	7·1	6·2	5·2	5·3	5·6
,, 18	6·9	7·1	8·0	5·4	5·4	7·8
,, 19	6·9	6·8	5·8	5·6	5·6	7·8
,, 20	...	...	...	5·5	5·4	7·2
,, 21	5·2	6·6	6·2	5·4	5·3	6·1
,, 22	5·6	6·0	5·6	4·9	5·0	5·0
,, 23	5·1	6·0	5·4	5·2	5·2	6·1
,, 24	5·2	5·8	4·6	5·2	5·2	5·6
,, 25	4·4	4·4	4·0	5·4	5·3	6·7
,, 26	6·4	6·8	9·0	5·2	5·2	5·6
,, 27	...	...	...	5·1	5·1	6·1
,, 28	4·9	5·2	5·0	5·2	5·1	5·6
,, 29	5·0	5·2	4·0	5·2	5·2	7·2
,, 30	4·6	5·2	5·0	5·0	5·1	6·1
,, 31	4·2	4·7	4·8	4·8	5·0	6·1

TABLE X.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT OXCAR LIGHTHOUSE.

Ten-day Period.	9 A.M.		3 P.M.	
	Surface.		Surface.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.				
April 1–10	...	...	...	...
„ 11–20	24·1	3·02	23·9	2·99
„ 21–30	24·6	3·10	24·6	3·10
May 1–10	24·7	3·12	24·7	3·12
„ 11–20	25·0	3·18	25·8	3·30
„ 21–31	25·0	3·18	25·1	3·20
June 1–10	25·2	3·21	25·2	3·21
„ 11–20	25·1	3·20	25·1	3·20
„ 21–30	25·4	3·24	25·3	3·23
July 1–10	25·4	3·24	25·4	3·24
„ 11–20	25·4	3·24	25·2	3·21
„ 21–31	25·5	3·26	25·5	3·26
Aug. 1–10	25·7	3·29	25·7	3·29
„ 11–20	25·6	3·27	25·7	3·29
„ 21–31	25·2	3·21	25·3	3·23
Sept. 1–10	24·4	3·07	25·4	3·07
„ 11–20	24·6	3·10	24·6	3·10
„ 21–30	24·8	3·14	24·7	3·12
Oct. 1–10	24·3	3·05	24·4	3·07
„ 11–20	23·8	2·97	24·2	3·03
„ 21–31	23·4	2·91	23·6	2·94
Nov. 1–10	24·1	3·02	24·8	3·14
„ 11–20	23·5	2·92	24·0	3·00
„ 21–30	23·0	2·80	23·2	2·84
Dec. 1–10	23·6	2·94	23·5	2·92
„ 11–20	22·8	2·78	23·2	2·84
„ 21–31	23·0	2·80	23·5	2·92

TABLE XI.—MONTHLY MEAN SPECIFIC GRAVITY AND SALINITY—OXCAR LIGHTHOUSE.

Month.	9 A.M.		3 P.M.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.				
April	24·3	3·05	24·3	3·05
May	25·0	3·18	25·2	3·21
June	25·3	3·23	25 2	3·21
July	25·4	3·24	25·4	3·24
August	25·7	3·29	25·6	3·27
September	24·6	3·10	24·8	3·14
October	23·5	2·92	24·1	3·02
November	23·2	2·82	24·0	3·00
December	23·5	2·92	23·4	2 89

TABLE XII.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT NORTH CARR ROCK LIGHT VESSEL.

Ten-Day Period.	Observations, 9 A.M.					
	Surface.		12 Fathoms.		Bottom (24 f.).	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.						
Apr. 1-10	...	...	...	...	...	...
,, 11-20	...	...	...	...	...	...
,, 21-30	24·6	3·10	...	...	24·9	3·16
May *1-10	25·3	3·23	...	...	25·3	3·23
,, 11-20	24·8	3·14	...	...	25·0	3·18
,, 21-31	25·2	3·21	...	...	25·3	3·23
June 1-10	25·0	3·18	...	...	25·2	3·21
,, 11-20	25·1	3·20	...	...	25·5	3·26
,, 21-30	25·1	3·20	...	...	25·6	3·27
July 1-10	25·4	3·24	25·4	3·24	25·5	3·26
,, 11-20	25·5	3·26	25·6	3·27	25·6	3·27
,, 21-31	25·4	3·24	25·5	3·26	25·6	3·27
Aug. 1-10	25·3	3·23	25·4	3·24	25·3	3·23
,, 11-20	25·4	3·24	25·5	3·26	25·6	3·27
,, 21-31	25·4	3·24	25·4	3·24	25·4	3·24
Sept. 1-10	25·3	3·23	25·4	3·24	25·5	3·26
,, 11-20	25·1	3·20	25·3	3·23	25·4	3·24
,, 21-30	25·6	3·27	25·6	3·27	25·8	3·30
Oct. 1-10	25·7	3·29	25·6	3·27	25·6	3·27
,, †11-20	25·6	3·27	25·6	3·27	25·5	3·26
,, 21-31	25·0	3·18	...	...	25·2	3·21
Nov. 1-10	24·8	3·14	...	...	24·9	3·16
,, 11-20	25·0	3·18	...	...	25·2	3·21
,, 21-30	24·5	3·08	...	...	24·2	3·03
Dec. 1-10	24·9	3·16	...	...	25·1	3·20
,, 11-20	24·8	3·14	...	...	24·9	3·16
21-31	24·7	3·12	...	...	25·0	3·18
	Observations, 3 p.m.					
1891.						
Apr. 1-10	...	...	...	...	...	...
,, 11-20	...	...	...	...	...	...
,, 21-30	24·6	3·10	...	...	25·0	3·18
May *1-10	25·5	3·26	...	...	25·6	3·27
,, 11-20	25·0	3·18	...	...	25·2	3·21
,, 21-31	25·5	3·26	...	...	25·5	3·26
June 1-10	24·9	3·16	...	...	25·3	3·23
,, 11-20	25·1	3·20	...	...	25·6	3·27
,, 21-30	25·2	3·21	...	...	25·6	3·27
July 1-10	25·4	3·24	25·5	3·26	25·7	3·29
,, 11-20	25·7	3·29	25·6	3·27	25·6	3·27
,, 21-31	25·3	3·23	25·7	3·29	25·7	3·29
Aug. 1-10	25·4	3·24	25·4	3·24	25·6	3·27
,, 11-20	25·4	3·24	25·5	3·26	25·5	3·26
,, 21-31	25·4	3·24	25·5	3·26	25·6	3·27
Sept. 1-10	25·4	3·24	25·7	3·29	25·7	3·29
,, 11-20	25·2	3·21	25·4	3·24	25·5	3·26
,, 21-30	25·9	3·32	25·9	3·32	26·0	3·34
Oct. 1-10	25·6	3·27	25·7	3·29	25·6	3·27
,, †11-20	25·6	3·27	25·6	3·27	25·6	3·27
,, 21-31	24·8	3·14	...	...	25·2	3·21
Nov. 1-10	25·5	3·26	...	...	24·9	3·16
,, 11-20	25·5	3·26	...	...	25·6	3·27
,, 21-30	24·8	3·14	...	...	24·5	3·08
Dec. 1-10	25·1	3·20	...	...	25·2	3·21
,, 11-20	24·5	3·08	...	...	24·7	3·12
,, 21-31	24·8	3·14	...	...	24·9	3·16

* 6th, 7th, 8th, and 9th only.

† 12th, 13th, and 15th only.

TABLE XIII.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT NORTH CARR ROCK LIGHT-VESSEL.

Monthly Means.

Month.	Observations, 9 A.M.					
	Surface.		12 Fathoms.		Bottom (24 f.).	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.						
*April	24·6	3·10	...	...	24·9	3·16
May	25·1	3·20	...	...	25·2	3·21
June	25·0	3·18	...	...	25·4	3·24
July	25·4	3·24	25·5	3·26	25·6	3·27
August	25·0	3·18	25·4	3·24	25·4	3·24
September	25·3	3·23	25·4	3·24	25·6	3·27
October	25·1	3·20	25·6	3·27	25·4	3·24
November	24·7	3·12	...	...	24·7	3·12
December	24·8	3·14	...	...	25·0	3·18
	Observations, 3 P.M.					
1891.						
*April	24·6	3·10	...	...	25·0	3·18
May	25·3	3·23	...	...	25·4	3·24
June	25·0	3·18	...	...	25·5	3·26
July	25·5	3·26	25·6	3·27	25·7	3·29
August	25·4	3·24	25·5	3·26	25·6	3·27
September	25·5	3·26	25·7	3·29	25·7	3·29
October	25·3	3·23	25·6	3·27	25·5	3·26
November	25·2	3·21	...	...	25·0	3·18
December	24·8	3·14	...	...	24·9	3·16

21–30 only.

TABLE XIV.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT THE BELL ROCK LIGHTHOUSE.

Ten-day Period.	9 A.M.		3 P.M.	
	Surface.		Surface.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.				
April 1–10	...	...	...	...
,, 11–20	...	...	...	...
,, 21–30	...	...	...	...
May 1–10	...	...	...	...
,, 11–20	...	...	...	...
,, 21–31	26·0	3·34	26·0	3·34
June 1–10	26·2	3·38	26·2	3·38
,, 11–20	26·1	3·36	26·1	3·36
,, 21–30	26·2	3·38	26·2	3·38
July 1–10	26·2	3·38	26·2	3·38
,, 11–20	26·2	3·38	26·2	3·38
,, 21–31	26·3	3·40	26·2	3·38
Aug. 1–10	26·4	3·42	26·2	3·38
,, 11–20	26·3	3·40	26·4	3·42
,, 21–31	26·3	3·40	26·2	3·38
Sept. 1–10	26·1	3·36	26·1	3·36
,, 11–20	26·2	3·38	26·1	3·35
,, 21–30	26·2	3·38	26·3	3·40
Oct. 1–10	26·2	3·38	26·2	3·38
,, 11–20	26·2	3·38	26·1	3·36
,, 21–31	25·6	3·27	25·7	3·29
Nov. 1–10	25·9	3·32	25·9	3·32
,, 11–20	25·9	3·32	25·8	3·30
,, 21–30	25·5	3·26	25·6	3·27
Dec. 1–10	25·8	3·30	25·6	3·27
,, 11–20	25·6	3·27	...	...
,, 21–31	24·8	3·14	...	...

TABLE XV.—MEAN MONTHLY SPECIFIC GRAVITY AND CALCULATED SALINITY AT THE BELL ROCK LIGHTHOUSE.

Month.	9 A.M.		3 P.M.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.				
April	...	...	...	...
May	26·0	3·34	26·0	3·34
June	26·2	3·38	26·2	3·38
July	26·2	3·38	26·2	3·38
August	26·3	3·40	26·3	3·40
September	26·3	3·40	26·3	3·40
October	26·0	3·34	26·0	3·34
November	25·8	3·30	25·8	3·30
December	25·6	3·27	25·6	3·27

TABLE XVI.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT ABERTAY LIGHT VESSEL.

Ten-day Period.	Observations, 9 A.M.					
	Surface.		3 or 4 Fathoms.*		Bottom.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.						
April 1-10	22·4	2·72	23·1	2·82	23·3	2·86
,, 11-20	23·2	2·84	24·7	3·12	25·0	3·18
,, 21-30	22·3	2·70	23·1	2·82	23·8	2·97
May 1-10	22·7	2·76	23·2	2·84	23·7	2·96
,, 11-20	24·5	3·08	24·8	3·14	24·9	3·16
,, 21-31	24·1	3·02	24·3	3·05	24·8	3·14
June 1-10	24·7	3·12	24·8	3·14	25·1	3·20
,, 11-20	25·3	3·23	25·6	3·27	25·7	3·29
,, 21-30	25·0	3·18	25·0	3·18	25·2	3·21
July 1-10	24·8	3·14	24·9	3·16	25·2	3·21
,, 11-20	25·4	3·24	25·5	3·26	25·7	3·29
,, 21-31	25·1	3·20	25·1	3·20	25·3	3·23
Aug. 1-10	24·8	3·14	25·0	3·18	25·3	3·23
,, 11-20	24·8	3·14	25·0	3·18	25·2	3·21
,, 21-31	24·6	3·10	24·8	3·14	25·0	3·18
Sept. 1-10	21·8	2·60	22·6	2·75	23·1	3·20
,, 11-20	23·0	2·80	23·5	2·92	24·4	3·07
,, 21-30	24·5	3·08	25·2	3·21	25·5	3·26
Oct. 1-10	22·0	2·64	22·6	2·75	23·1	2·82
,, 11-20	19·6	2·22	21·2	2·52	22·3	2·70
,, 21-31	22·8	2·78	23·7	2·96	24·5	3·08
Nov. 1-10	22·4	2·72	23·5	2·92	23·9	2·99
,, 11-20	20·2	2·31	23·7	2·96	22·4	2·72
,, 21-30	23·1	2·82	23·7	2·96	25·2	3·21
Dec. 1-10	22·0	2·64	25·2	3·21	23·2	2·84
,, 11-20	20·1	2·29	21·5	2·54	22·2	2·68
,, 21-31	22·4	2·72	23·8	2·97	24·6	3·10
	Observations, 3 P.M.					
1891.						
April 1-10	24·4	3·07	24·6	3·10	24·9	3·16
,, 11-20	24·1	2·66	24·1	3·02	24·6	3·10
,, 21-30	24·8	3·14	25·2	3·21	25·3	3·23
May 1-10	23·2	2·84	24·1	3·02	24·7	3·29
,, 11-20	23·8	2·97	24·4	3·07	24·7	3·29
,, 21-31	24·7	3·12	25·0	3·18	25·3	3·23
June 1-10	24·8	3·14	24·9	3·16	25·1	3·20
,, 11-20	24·3	3·05	24·8	3·14	25·1	3·20
,, 21-30	25·2	3·21	25·3	3·23	25·4	3·24
July 1-10	25·4	3·24	25·4	3·24	25·6	3·27
,, 11-20	24·9	3·16	25·0	3·18	25·4	3·24
,, 21-31	25·3	3·23	25·3	3·23	25·4	3·24
Aug. 1-10	25·8	3·30	25·9	3·26	25·9	3·32
,, 11-20	24·8	3·14	25·2	3·21	25·4	3·24
,, 21-31	24·4	3·07	24·7	3·12	25·3	3·23
Sept. 1-10	25·4	3·24	25·5	3·26	25·7	3·29
,, 11-20	24·7	3·12	25·1	3·20	25·3	3·23
,, 21-30	24·5	3·08	25·1	3·20	25·4	3·24
Oct. 1-10	24·8	3·14	25·1	3·20	25·5	3·26
,, 11-20	23·4	2·89	24·7	3·12	25·0	3·18
,, 21-31	22·4	2·72	24·3	3·05	24·9	3·16
Nov. 1-10	24·6	3·10	24·9	3·16	24·9	3·16
,, 11-20	24·6	3·10	21·2	2·52	25·0	3·18
,, 21-30	23·1	2·82	24·4	3·07	24·7	3·12
Dec. 1-10	23·1	2·82	22·7	2·76	24·6	3·10
,, 11-20	23·8	2·97	24·2	3·03	24·5	3·08
,, 21-31	23·2	2·84	24·5	3·08	24·9	3·16

* Readings at 4 fathoms until 19th May, thereafter at 3 fathoms.

TABLE XVII.—MONTHLY MEAN SPECIFIC GRAVITY AND SALINITY AT ABERTAY LIGHT VESSEL.

Month.	Observations, 9 A.M.					
	Surface.		3 or 4 Fathoms.*		Bottom.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1891.						
April	22·6	2·75	23·6	2·94	24·0	3·00
May	23·8	2·97	24·1	3·02	24·5	3·08
June	25·0	3·18	25·1	3·20	25·3	3·23
July	25·1	3·20	25·2	3·21	25·4	3·24
August	24·7	3·12	24·9	3·16	25·2	3·21
September	23·1	2·82	23·8	2·97	24·3	3·05
October	21·5	2·54	22·5	2·74	23·3	2·87
November	21·9	2·62	23·6	2·94	23·8	2·97
December	21·5	2·54	23·5	2·92	23·3	2·87
	Observations, 3 P.M.					
1891.						
April	23·8	2·97	24·6	3·10	24·9	3·16
May	23·9	2·99	24·5	3·08	24·9	3·16
June	24·8	3·14	25·0	3·18	25·2	3·21
July	25·2	3·21	25·2	3·21	25·5	3·26
August	25·0	3·18	25·3	3·23	25·5	3·26
September	24·9	3·16	25·2	3·21	25·5	3·26
October	23·5	2·92	24·7	3·12	25·1	3·20
November	24·1	3·02	23·5	2·92	24·9	3·16
December	23·4	2·89	23·8	2·97	24·7	3·12

* Readings at 4 fathoms until 19th May, thereafter at 3 fathoms.

II. AT THE 'GARLAND'S' TRAWLING STATIONS, FIRTH OF FORTH, 1891.

Station I.

Date.	West End of Station.						East End of Station.					
	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.
1891.												
Jan. 15	15·40	30·25	5·0	5·1	5·2	2	30·33	3·9	5·5	5·4	2½	13·30
Feb. 23	10·55	30·28	6·7	5·2	5·3	3	30·28	7·8	5·2	5·4	4	13·0
Mar. 13	10·35	29·90	3·9	4·5	5·2	2	29·89	6·7	5·3	4·7	3	13·25
Apr. 15	10·43	30·03	8·3	5·1	5·0	2	30·04	9·5	5·5	4·8	2¾	12·43
May 23	13·10	29·64	13·2	8·9	8·1	4	29·64	11·1	8·9	7·2	3½	11·10
June 22	16·30	30·31	14·5	13·3	9·5	3½	30·31	11·6	12·8	8·6	4½	13·50
July 15	9·45	30·19	15·6	13·1	10·0	2¾	30·17	15·6	14·4	10·0	3½	11·45
Aug. 14	10·22	29·80	13·3	13·0	12·0	3	29·80	16·1	13·3	12·2	7	12·15
Sept. 19	8·30	29·84	14·5	12·7	12·6	1½	29·87	14·5	12·6	12·3	3½	10·35
Oct. 24	10·26	29·67	10·6	10·0	10·8	2	29·72	12·8	10·5	10·8	2½	12·20
Nov. 25	10·23	29·55	5·3	7·6	8·9	2	29·55	5·6	8·3	8·9	4	12·28
Dec. 17	15·15	30·32	4·5	6·8	7·0	2	30·33	3·3	7·4	7·5	3	13·5

Station II.

Date.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.
Jan. 15	13·0	30·33	3·9	5·2	5·4	2½	30·42	4·5	5·5	5·5	2½	11·0
Feb. 24	13·15	30·28	11·1	5·3	5·7	3	30·30	7·8	5·6	5·2	3	12·15
Mar. 13	15·35	29·89	13·3	5·0	4·8	2½	29·89	10·6	5·2	4·8	2¾	14·10
Apr. 15	15·23	30·01	8·3	5·3	4·8	3	30·02	8·1	5·6	4·9	3	13·27
May 25	14·15	29·82	10·6	8·3	10·4	4	29·82	9·2	8·4	8·3	3	12·30
June 22	13·5	30·31	15·0	12·8	9·3	4	30·32	13·6	13·0	9·5	3½	11·30
July 15	12·20	30·17	15·6	14·0	10·0	3½	30·12	15·6	14·7	11·1	3½	14·15
Aug. 14	12·40	29·80	16·7	13·1	12·2	7	29·80	15·6	13·0	12·0	6½	14·25
Sept. 19	13·0	29·85	15·0	12·8	12·5	4	29·85	14·5	12·7	12·3	4	11·0
Oct. 23	15·10	29·35	12·2	10·6	10·7	3½	29·33	11·7	10·7	12·1	3¼	13·45
Nov. 21	12·40	29·83	8·1	8·8	8·7	3½	29·83	8·1	8·3	9·1	3	11·15
Dec. 17	12·30	30·33	3·9	5·8	7·0	1½	30·33	4·5	6·1	7·4	2½	10·45

Physical Observations—*continued.*

Station III.

Date.	West End of Station.						East End of Station.					
	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.
1891.												
Jan. 19	14·0	30·01	3·9	4·5	5·0	3½	30·30	2·2	4·0	4·0	2¾	11·0
Feb. 18	10·30	30·50	7·2	5·3	5·3	2	30·51	7·2	5·3	5·1	3½	12·53
Mar. 14	14·0	29·83	6·1	4·9	4·6	2½	29·87	6·1	5·0	5·0	2	11·30
May 4	16·30	29·99	12·2	7·6	6·1	3	29·96	12·2	7·5	6·1	5	14·20
May 27	16·35	29·54	9·5	8·3	8·4	3½	29·54	11·6	8·3	8·3	3½	14·0
June 20	12·55	30·32	15·8	13·0	8·3	3	30·32	15·6	13·0	8·3	3	10·55
July 18	10·30	29·81	17·8	15·0	10·7	3	29·83	16·1	14·6	10·0	5	12·40
Aug. 17	16·10	29·69	15·0	12·9	11·9	4	29·74	13·6	13·0	11·7	4½	14·0
Sept. 23	16·40	30·10	13·2	12·2	11·9	1½	30·12	15·6	12·2	11·9	1½	14·25
Oct. 19	15·0	29·23	10·6	11·1	11·0	2	29·22	8·9	11·0	11·0	3	13·0
Nov. 20	15·40	29·71	8·7	8·9	9·1	2¾	29·70	8·3	8·6	8·5	2¼	13·15
Dec. 24	10·20	30·14	3·9	6·1	7·1	2½	30·13	3·9	6·5	7·0	3	12·10
Station IV.												
Jan. 24	13·30	29·22	5·0	4·2	4·0	2	29·22	5·0	3·9	3·9	2	11·0
Feb. 17	10·10	30·49	7·5	5·2	5·0	2½	30·50	8·0	5·3	5·1	2½	12·50
Mar. 18	10·35	30·06	3·9	4·5	4·2	1	30·03	7·2	4·8	4·3	2	14·25
May 4	10·25	29·89	12·2	7·8	7·2	3	29·96	11·7	8·6	7·3	3½	13·55
May 26	15·0	29·69	9·6	8·6	8·7	2	29·73	9·4	8·0	8·3	2½	11·45
June 18	10·30	30·12	17·2	12·1	11·6	2½	30·13	15·3	11·4	11·8	2¾	13·45
July 17	10·30	29·73	20·0	13·6	13·0	2½	29·76	18·9	...	...	4½	13·30
Aug. 15	10·20	29·71	16·1	11·1	13·6	2½	29·70	15·6	13·3	13·5	2½	12·25
Sept. 18	14·40	29·70	16·1	12·9	12·8	2	29·71	15·6	13·1	12·9	2	11·30
Oct. 16	11·40	29·11	10·3	10·6	10·5	1½	29·08	10·3	10·6	10·9	2	14·30
Nov. 20	10·0	29·71	8·3	7·5	7·4	1¾	29·72	9·4	7·8	7·7	1¾	12·0
Dec. 18	14·10	30·34	6·1	6·3	6·5	2¾	30·36	5·0	6·5	6·6	2	10·50
Station V.												
Jan. 21	11·30	29·26	3·3	5·4	6·0	3¼	29·28	3·3	5·8	6·0	4	14·10
Feb. 20	12·45	30·27	10·0	5·5	5·5	6	30·28	5·0	5·8	5·7	6	10·45
Mar. 19	13·50	29·98	4·5	4·8	5·0	2	29·93	5·5	4·7	4·6	3	16·20
May 6	11·15	30·09	6·7	7·0	5·5	6	30·09	6·3	6·9	5·2	6	9·0
May 28	15·15	29·54	11·1	8·6	7·0	7	29·54	8·4	8·4	6·9	6½	13·10
June 19	11·20	30·26	17·2	10·7	7·7	6	30·26	14·2	10·0	7·3	6	13·45
July 17	17·30	29·77	16·1	13·9	9·5	6	29·76	17·2	14·0	9·0	6¾	15·35
Aug. 18	16·10	29·57	15·6	13·3	11·1	7	29·60	13·9	12·3	11·1	7½	14·10
Oct. 1	11·30	29·46	11·7	11·9	11·7	5	29·46	12·6	12·1	11·8	5½	13·35
Oct. 22	15·0	29·06	11·7	10·8	10·7	5½	29·06	13·3	11·1	10·8	5½	12·45
Nov. 24	11 0	29·81	7·8	8·3	9·2	4½	29·80	7·7	8·4	9·2	5½	13·0
Dec. 23	10·45	30 33	5·9	7·4	7·6	5	30·33	5·9	7·4	7·7	6	13·1
Station VI.												
Jan. 21	15·55	29·27	1·1	5·5	5·5	2¾	29·28	1·7	5·1	5·2	3	14·50
Feb. 20	...	...	...	...	...	...	...	...	...	...	...	...
Mar. 21	13·0	29·93	...	4·7	4·4	2½	29·93	5·0	4·9	4·5	2¾	12·10
May 6	12·30	30·05	7·8	6·7	6·3	6	30·06	7·0	6·6	5·8	6½	11·48
May 28	11·5	29·52	9·1	8·1	7·6	5½	29·53	8·9	8·2	...	5	12·10
June 24	15·30	30·13	13·7	11·6	10·6	5	30·13	13·1	11·3	10·5	5½	14·45
July 15	16·50	30·7	14·5	12·8	12·2	5½	30·80	13·9	13·1	9·8	5	15·50
Aug. 19	17·50	29·56	13·9	12·9	12·2	3	29·55	13·6	12·3	12·2	7	17·0
Oct. 3	6·12	29·90	9·8	11·9	11·8	3	29·91	11·4	11·9	11·8	4	7·10
Oct. 22	16·25	29·07	10·6	10·8	10·6	4½	29·06	11·1	10·9	10·6	5	15·35
Nov. 25	13·45	29·53	5·6	8·3	9·2	4½	29·54	5·9	8·3	9·1	4	14·40
Dec. 23	15·20	30·28	4·8	7·2	7·5	4¼	30·29	5·0	7·1	7·2	4½	14·30

Physical Observations—*continued.*

Station VII.

Date.	West End of Station.						East End of Station.					
	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.
1891.												
Jan. 12	14·0	30·45	6·1	4·3	4·5	2½	30·46	7·8	5·0	5·0	2½	11·80
Feb. 20	8·0	30·31	3·3	5·1	5·1	3½	30·30	4·7	5·1	5·2	4	9·30
Mar. 19	11·15	29·95	3·9	4·9	4·8	3	29·97	4·5	4·8	4·5	2½	13·0
May 5	12·20	30·08	10·6	7·2	7·3	4½	30·08	10·3	7·3	7·3	4½	15·0
May 27	10·35	29·52	9·2	7·6	7·7	3½	30·24	14·5	11·8	8·5	5	12·35
June 23	14·15	30·24	12·8	11·3	8·9	4½	29·80	15·0	...	...	5½	13·50
July 16	11·50	29·89	13·9	13·7	10·1	5	29·78	13·3	12·4	11·4	5	12·30
Aug. 17	10·35	29·82	13·9	12·3	12·2	3½	29·03	11·4	10·7	10·7	3	12·25
Sept. 23	13·45	30·12	13·9	12·2	11·8	2½	30·13	13·3	12·2	11·9	2	14·25
Oct. 21	14·20	29·02	12·2	10·6	10·5	2¾	29·06	13·3	11·1	10·8	5½	14·25
Nov. 24	15·50	29·78	3·9	7·2	8·7	3	29·78	4·2	7·2	8·7	3½	14·5
Dec. 21	11·0	30·48	5·6	6·2	7·0	2½	30·48	6·1	6·5	7·3	2¾	12·45

Station VIII.

Date.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.
Jan. 29	11·45	29·50	7·2	4·9	5·3	4	29·46	6·7	5·1	5·2	4	13·30
Feb. 19	12·0	30·41	10·0	5·8	5·5	4	30·37	7·4	5·7	5·8	5	14·0
Mar.	no tra	wling	...	...	...	...	...	...	...	...	...	...
Apr. 24	...	...	...	...	...	...	...	...	...	...	...	...
May 29	10·50	29·57	8·9	7·9	7·2	5	29·57	10·6	8·2	6·8	7	12·40
June 24	9·5	30·12	14·6	10·6	8·3	5	30·13	13·2	11·4	7·9	7½	10·50
July 21	11·35	29·82	14·5	14·2	10·1	5	29·78	14·5	13·3	8·9	5	13·45
Aug. 18	11·20	29·59	13·4	12·7	11·1	7	29·60	13·3	12·6	...	8	13·30
Sept. 24	10·45	29·97	11·1	12·1	11·8	3	29·95	11·6	12·2	11·8	3½	12·30
Oct. 30	11·30	30·56	11·7	10·0	10·5	5	30·55	9·5	10·6	10·7	9	13·10
Nov. 23	10·50	29·81	8·9	7·9	9·4	4	29·81	8·9	9·1	9·4	6½	12·45
Dec. 21	13·10	30·48	6·1	6·9	7·5	3½	30·44	5·6	8·1	7·7	5	15·10

Station IX.

Date.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.
Jan. 29	16·0	29·44	7·2	5·5	5·6	4	29·44	6·7	5·0	5·3	2¾	14·10
Feb. 19	14·30	30·37	8·3	5·8	5·7	5	30·35	7·0	5·7	5·5	6¼	16·15
Mar.	no tra	wling	...	...	...	...	...	...	...	...	...	...
Apr. 14	13·0	30·12	9·8	5·7	4·7	10	30·12	10·0	5·5	4·8	8	10·40
May 29	13·0	29·58	10·3	8·2	6·9	7	29·60	10·6	8·2	6·1	7½	14·50
June 24	13·30	30·12	14·5	11·4	...	7¾	30·13	13·6	11·8	7·3	7½	11·50
July 21	14·15	29·79	13·9	13·7	8·9	5	29·77	13·9	13·3	8·9	6	16·45
Aug. 19	15·45	29·54	15·0	12·8	10·0	9	29·53	13·1	13·0	10·0	9	13·55
Sept. 24	15·5	29·92	15·0	13·3	11·7	3¾	29·94	12·2	12·0	11·7	3½	13·20
Oct. 30	13·30	30·55	9·5	10·5	10·8	9	30·56	9·5	10·6	10·6	9½	15·30
Nov. 23	13·40	29·81	9·5	8·7	9·5	6½	29·81	9·8	9·0	9·5	7	15·30
Dec. 22	14·15	30·43	6·1	7·0	7·9	5½	30·48	6·1	6·9	7·8	5½	12·20

III.—TEMPERATURE OBSERVATIONS ON CRUISERS, 1887–91.

* Observations made on board the 'Vigilant' are marked with an asterisk; those not so marked were taken on board the 'Jackal.'

1. CAMPBELTOWN LOCH.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1887.												
April 21*	.	.	.	.	.	.	9·8	7·3	6·9	.	6·8	.
,, 22*	.	.	.	.	.	.	8·6	7·3	6·9	.	6·7	.
,, 24*	7·7	7·2	6·9	6·8 (9)	.	.	5·7	6·9	6·7	6·8 (9)	.	.
,, 25*	7·6	6·9	6·8	.	6·5	.	.	.	.	.	.	.
,, 28*	7·8	7·0†	6·8	.	6·8	.	9·1	7·2‡	6·8	.	6·7	.
May 5*	9·3	8·6	8·4	.	6·9	.	.	.	.	.	.	.
,, 10*	.	.	.	.	.	.	11·0	7·8	7·6	.	7·2	.
,, 11*	9·9	7·6	7·6	.	7·6	.	10·0	7·7	7·3	.	7·2	.
,, 14*	10·0	8·2	8·0	7·9 (8)	7·7	.	10·7	8·9	8·6	.	8·4	.
,, 15*	11·2	8·3	8·3	.	8·2	.	11·3	9·1	8·7	.	8·5	.
,, 16*	13·2	7·9	7·8	.	8·0	.	.	.	.	.	.	.
,, 27*	12·2	10·7	9·9	.	9·0	.	18·0	11·1	8·9	.	8·4	.
Nov. 3*	8·0	9·4	9·5	.	9·5	.	.	.	.	.	.	.
,, 30*	6·3	8·0	7·9	.	8·0	.	8·9	8·0	7·9	.	8·0	.
1888.												
Feb. 2*	.	.	.	.	.	.	6·8	6·1	5·9	.	5·9	.
,, 15*	1·4	6·0	6·1	6·2 (9)	.	.	3·4	6·2	6·1	.	6·1	.
,, 16*	1·6	5·7	6·1	6·1 (9)	.	.	.	.	.	.	.	.
April 26*	7·0	6·2	6·1	.	6·1	.	.	.	.	.	.	.
June 21	15·7	12·7	11·8	9·1 (9)	.	.	.	.	.	.	.	.
Sept. 29*	.	.	.	.	.	.	10·8	12·2	12·2	.	12·1	.
,, 30*	8·5	12·0	11·9	.	11·8	.	8·7	12·0	11·9	.	11·8	.
Nov. 28*	.	.	.	.	.	.	5·7	8·4	8·5	.	9·0	.
,, 29*	5·2	7·9	8·1	.	8·4	.	5·0	7·9	8·1	8·3 (9)	.	.
1889.												
Jan. 11*	5·8	6·9	6·9	6·9 (9)	.	.	6·1	7·2	6·9	.	6·9	.
Mar. 20*	6·3	6·8	6·8	6·7 (8)	.	.	7·8	6·7	6·8	.	6·8	.
May 7*	.	.	.	.	.	.	13·1	11·1	8·4	.	7·4	.
,, 8*	10·7	10·1	8·4	7·3 (9)	.	.	10·2	11·3	8·7	.	7·4	.
,, 9*	10·5	10·8	8·2	7·9 (9)	.	.	13·3	10·7	7·9	7·3 (9)	.	.
Sept. 26*	.	.	.	.	.	.	13·9	11·7	11·5	11·5 (9)	.	.
,, 27*	12·9	11·4	11·5	11·6 (9)	.	.	12·8	11·6	11·7	.	11·7	.
,, 28*	12·2	11·7	11·6	11·7 (9)	.	.	12·2	11·5	11·5	.	11·5	.
,, 29*	11·1	11·4	11·5	11·5 (9)	.	.	.	.	.	.	.	.
Oct. 22*	10·4	10·1	10·3	.	10·4	.	10·7	10·2	10·3	10·5 (9)	.	.
Nov. 6*	.	.	.	.	.	.	8·9	10·0	10·0	.	10·0	.
,, 7*	10·7	10·1	10·2	.	10·2	.	.	.	.	.	.	.
,, 27*	.	.	.	.	.	.	8·5	8·8	9·1	.	9·0	.
Dec. 12*	5·0	8·0	8·4	9·0 (9)	.	.	6·3	8·0	8·4	.	9·0	.
1890.												
Jan. 15*	.	.	.	.	.	.	7·5	7·6	7·6	.	7·7	.
,, 16*	11·1	7·7	7·6	.	7·6	.	10·3	7·6	7·6	.	7·6	.
Feb. 5*	5·2	7·2	7·2	.	7·3	.	7·4	9·4	9·5	.	7·3	.
,, 6*	5·1	7·1	7·2	7·3 (9)	.	.	.	.	.	.	.	.
Mar. 27*	9·6	7·0	6·9	7·1 (9)	.	.	13·1	7·2	7·0	.	7·1	.
April 10*	6·5	7·2	7·2	7·1 (9)	.	.	.	.	.	.	.	.
,, 17*	.	.	.	.	.	.	9·3	7·6	7·6	.	7·6	.
,, 25*	13·6	7·7	7·7	7·6 (9)	.	.	13·3	7·9	7·7	7·6 (9)	.	.
May 7*	12·0	8·7	8·5	8·3 (9)	.	.	15·7	11·3	9·2	.	8·2	.
,, 8*	11·2	11·1	9·8	8·5 (9)	.	.	17·1	11·3	9·5	.	8·5	8·5
Sept. 24*	15·1	12·6	12·6	.	12·3	.	.	.	.	.	.	.
Oct. 9*	12·2	12·2	12·2	.	12·3	.	.	.	.	.	.	.
Nov. 6*	.	.	.	.	.	.	10·5	10·7	10·7	10·7 (9)	.	.
,, 7*	5·5	10·6	10·7	.	10·7	.	6·8	10·5	10·7	10·7 (9)	.	.
,, 20*	.	.	.	.	.	.	13·3	10·5	10·5	.	10·6	.
,, 27*	1·8	8·3	9·0	.	10·1	.	1·9	8·0	8·9	.	10·1	.
1891.												
Jan. 7*	1·8	6·1	.	.	6·2	.	1·6	6·2	6·1	6·1 (9)	.	.
Feb. 2*	9·7	6·9	6·9	.	6·9	6·9 (11)	10·5	7·0	6·9	.	6·9	6·8 (12)
,, 3*	10·2	7·0	7·1	.	6·9	6·9 (11)	.	.	.	.	.	.
,, 25*	.	.	.	.	.	.	7·9	6·7	6·7	.	6·8	6·8 (11)
Mar. 12*	3·0	5·9	6·1	.	6·4	.	5·2	6·2	6·2	.	6·3	6·4 (11)
April 23*	.	.	.	.	.	.	11·0	9·1	7·7	7·3 (9)	.	.
Oct. 2*	12·8	12·0	11·8	.	11·8	.	12·7	11·9	11·8	.	11·8	.
,, 13*	.	.	.	.	.	.	8·3	11·2	11·2	11·2 (9)	.	.
,, 14*	7·8	10·7	11·1	.	11·2	.	9·0	11·0	10·9	11·2 (9)	.	.
,, 23*	9·5	10·4	11·2	11·3 (9)	.	.	.	.	.	.	.	.
Dec. 17*	3·6	7·9	7·9	.	8·5	.	7·2	7·8	8·0	.	.	8·5 (11)

† 6°·9 at 3 fathoms.

‡ 7°·2 at 3 fathoms.

2. LAMLASH HARBOUR.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.
1887.												
Apr. 26*	3·7	6·7	7·1	6·9	6·5(15)	6·3(20)	5·0	7·6	7·3	7·1	6·9(15)	6·8(20)
Oct. 20*	.	.	.	.	.	.	10·4	11·2	11·3	11·3	11·3(15)	11·3(16)
,, 21*	10·3	11·2	11·2	11·3	11·2(15)	.	.	.	.	.	.	.
,, 28*	11·3	11·1	11·2	11·3	11·4(15)	.	.	.	.	.	.	.
Nov. 1*	9·5	10·7	10·5	10·6	10·5(15)	.	8·5	10·7	10·6	10·6	10·5(15)	.
,, 16*	7·2	9·6	9·6	9·8	10·0(15)	.	7·2	9·6	9·6	9 8	9·7(15)	.
1888.												
Jan. 25*	8·0	7·2	7·1	7·1	7·0(15)	.	9·2	7·1	7·1	7·2	7·1(14)	.
,, 26*	6·7	7·1	7·2	7·1	7·1(15)	.	6·6	7·1	6·9	7·1	7·0(14)	.
,, 31*	.	.	.	.	.	.	4·4	6·6	6·7	6·6	.	6·6(16)
Feb. 27*	.	.	.	.	.	.	4·6	5·7	5·6	5·7	.	5·6(16)
Mar. 6*	.	.	.	.	.	.	5·5	5·7	5·6	5·7	5·6(15)	5·7(17)
,, 7*	6·7	5·6	5·7	5·6	5·7(15)	5·6(19)	6·8	5·6	5·7	5·6	5·7(15)	5·6(18)
Oct. 18*	.	.	.	.	.	.	11·5	10·1	10·1	10·1	.	.
Nov. 22*	.	.	.	.	.	.	10·2	9·5	9·6	9·6	9·7(15)	9·7(17)
,, 27*	.	.	.	.	.	.	5·2	9·3	9·4	9·6	9·7(15)	.
1889.												
Jan. 15*	.	.	.	.	.	.	6·9	7·3	7·3	7·6	7·6(15)	7·6(16)
,, 21*	.	.	.	.	.	.	8·4	7·0	7·2	7·2	7·2(15)	.
,, 22*	3·0	6·8	7·2	7·2	7·2(14)	.	7·7	7·2	7·2	7·2	7·2(15)	.
,, 30*	.	.	.	.	.	.	5·7	7·4	7·4	7·4	7·5(15)	.
,, 31*	8·7	7·4	7·5	7·5	7·5(15)	.	9·8	7·5	7·5	7·5	7·5(15)	.
Feb. 6*	.	.	.	.	.	.	3·8	6·7	6·7	6·7	6·7(15)	6·7(16)
,, 7*	2·2	6·6	6·6	6·6	.	.	.	.	.	.	.	.
,, 14*	4·2	6·1	6·1	6·1	6·2(15)	6·2(16)	.	.	.	.	.	.
Aug. 24*	.	.	.	.	.	.	10·2	12·3	12·4	12·4	12·3(15)	.
Oct. 10*	.	.	.	.	.	.	10·6	11·3	11·3	11·3	11·3(14)	.
,, 15*	.	.	.	.	.	.	11·1	11·2	11·2	11·2	11·2(14)	.
Nov. 26*	.	.	.	.	.	.	3·3	9·9	10·0	10·0	10·1(15)	.
Dec. 17*	.	.	.	.	.	.	10·5	8·8	8·8	8·8	8·8(11)	.
,, 18*	10·1	8·8	8·9	8·9	8·9(12)	.	8·2	8·8	8·9	8·9	8·9(11)	.
1890.												
Jan. 14*	.	.	.	.	.	.	11·7	7·9	7·8	7·8	7·8(14)	.
Sept. 25*	.	.	.	.	.	.	14·4	13·3	13·1	13·1	12·6(15)	.
,, 26*	15·8	12·9	12·9	12·9	12·8(15)	.	.	.	.	.	.	.
Oct. 14*	.	.	.	.	.	.	12·2	12·4	12·4	12·3	12·3(14)	.
,, 15*	.	.	.	.	.	.	7·2	12·3	12·3	12·3	12·3(14)	.
Nov. 19*	.	.	.	.	.	.	11·6	10·7	10·8	10·8	10·8(15)	.
Dec. 14*	4·6	9·0	9·0	9·1	9·1(15)	.	.	.	.	.	.	.
1891.												
Jan. 4*	5·2	7·8	7·9	7·8	7·9(14)	.	.	.	.	.	.	.
,, 20*	7·3	7·2	7·2	7·2	7·2(15)	.	3·7	7·1	7·1	7·2	7·1(14)	.
,, 21*	2·4	6·7	6·8	7·1	7·1(15)	.	.	.	.	.	.	.
,, 24*	.	.	.	.	.	.	4·5	6·5	6·5	6·5	6·3(13)	.
Feb. 17*	.	.	.	.	.	.	7·1	6·8	6·7	6·8	6·8(13)	.
,, 24*	7·3	6·5	6·7	6·7	6·8(12)	.	10·5	6·8	6·8	6·8	6·8(12)	.
Sept. 29*	.	.	.	.	.	.	14·3	12·3	12·3	12·3	12·3(15)	.
,, 30*	.	.	.	.	.	.	13·4	12·3	12·3	12·3	12·3(15)	12·3(16)
Nov. 18*	.	.	.	.	.	.	11·7	10·0	10·0	10·0	10·1(15)	.
,, 19*	9·4	10·1	10·1	10·2	10·2(14)	.	9·5	10·1	10·1	10·1	10·1(15)	.
Dec. 28*	.	.	.	.	.	.	5·2	8·2	8·2	8·4	8·3(14)	.

CLYDE SEA AREA. PLATEAU. EAST SIDE.

Date.	Hour.	Air.	Surface.	5 fathoms.	10 fathoms.	15 fathoms.	20 fathoms.	25 fathoms.	30 fathoms.
1887.									
Oct. 1	3 p.m.	13·7	12·2	12·1	12 1	12·0	11·9	11·9	.
1888.									
Feb. 14	,,	4·1	6·1	6·7	6·9	.	7.1	.	7·2
,, 17	9 a.m.	5·0	6·2	6·2	6·6	.	6·9	.	7·2
Apr. 26	3 p.m.	7·6	6·8	6·6	6·6	6·4	6·3	.	6·2
May 9	,,	9·1	8·3	7·2	7·1	6·5	6·5	6·5	.

CLYDE SEA AREA. PLATEAU. WEST SIDE.

Date.	Hour.	Air.	Surf.	5 fathoms.	10 fathoms.	15 fathoms.	20 fathoms.	25 fathoms.	30 fathoms.	Over 30 fathoms.
1888.										
Apr. 22	9 a.m.	9·1	7·2	7·0† 7·1‡	6·9	6·8	6·6	.	.	.
,, 27	,,	7·5	7·1	7·0	6·7	6·6	6·3	6·2	.	.
,, ,,	3 p.m.	5·6	7·3	7·2	7·1	6·8	6·6	.	6·3	.
May 4	,,	11·3	9·1	9·0	8·8	8·7	8·4	8·0	8·0	7·8 (36 & 42)
,, 10	9 a.m.	9·4	7·7	7·6† 7·3‡	7·4	7·3	7·2	7·1	.	.
,, 16	3 p.m.	15·0	10·8	10·5	10·3	10·0	9·9	9·7	.	.
,, 26	,,	12·9	10·8	10·4	10·2	10·0	9·6	9·3	.	.
Oct. 5	,,	12·5	12·4	12·3	12·3	12·2	12·2	12·1	.	.
,, 6	9 a.m.	11·9	12·3	12·3	12·2	12·2	12·2	12·2	.	.
,, ,,	3 p.m.	12·3	12·4	12·3	12·3	12·2	12·2	12·2	12·1	.
Nov. 22	,,	7·2	9·5	9·7	10·0	10·0	.	.	.	.
Dec. 1	9 a.m.	10·0	8·9	8·8	9·1	9·1	9·4	.	.	.
1888.										
Jan. 17	,,	2·7	7·0	7·2	7·3	.	7·3	.	.	.
Feb. 1	3 p.m.	3·0	6·3	6·7	6·9	6·9	.	.	.	.
Oct. 1	9 a.m.	6·1	11·3	11·3	12·2	12·2	12·1	12·1	.	.
Nov. 28	,,	5·4	8·2	9·0	9·5	9·6	9·6	9·6	.	.

† At 3 fathoms. ‡ At 6 fathoms. † At 22 fathoms.

4. ROTHESAY BAY.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1887.												
Apr. 29*	.	.	.	.	.	.	9·4	7·6	7·6	.	7·3	.
,, 30*	8·8	7·0	6·6†	.	6·5	.	11·2	8·1	7·7	.	7·2	.
May 1*	8·7	7·7	7·2	.	7·1	.	10·9	8·7	7·5	.	7·0	.
,, 2*	8·3	7·7	7·2	.	6·9	.	10·8	8·1	7·5	.	6·9	.
,, 3*	8·8	8·3	7·7	6·8(9)	.	.	10·5	9·0	7·7	.	7·0	.
,, 17*	.	.	.	.	.	.	11·9	9·8	7·9	.	7·2	6·7(13)
June 8*	15·1	9·0	8·6	.	8·5	.	16·2	9·5	8·5	.	8·0	.
,, 9*	12·9	8·4	8·1	.	8·0	.	13·3	7·7	7·6	.	7·5	.
,, 10*	13·9	10·1	10·0	.	9·7	.	17·2	11·1	9·9	.	7·9	.
Oct. 2*	12·1	11·8	11·9	.	12·1	12·2(13)	13·9	12·2	12·1	.	12·0	11·9(13)
,, 3*	.	.	.	.	.	.	14·0	11·9	12·0	.	12·1	12·1(13)
,, 7*	13·3	11·9	12·2	12·2(8)	.	12·2(11)	13·1	11·3	11·8‡	11·9(8)	.	12·2(12)
,, 8*	11·3	11·2	11·9	12·1(8)	.	12·2(11)	10·1	11·9	11·9	12·2(8)	.	12·2(12)
,, 9*	8·3	11·3	11·8	.	12·2	.	.	.	.	.	.	.
,, 10*	8·2	11·1	11·1‡	11·8(8)	11·8	.	.	.	.	.	.	.
,, 14*	7·8	10·7	10·7‡	10·8(8)	.	10·9(11)	7·1	10·7	10·7	.	11·0	.
,, 15*	6·9	10·7	10·9‡	11·0(8)	.	11·2(11)	10·0	10·5	10·7	.	11·2	.
,, 16*	8·5	10·7	11·0	.	10·8	10·8(11)	12·1	11·0	11·0	.	11·6	.
,, 17*	10·3	11·0	11·0‡	11·1(8)	.	11·2(11)	10·7	10·7	10·9‡	11·1(8)	.	11·1(11)
,, 22*	10·1	11·1	11·1	.	11·1	.	11·7	11·1	11·1	.	11·1	11·1(12)
,, 23*	10·6	11·1	11·1	.	11·1	.	10·0	11·1	11·2	.	11·1	11·0(12)
,, 24*	4·8	10·9	10·2	.	10·6	.	5·8	11·0	11·0	.	10·9	11·0(11)
,, 25*	9·5	11·1	11·0	11·0(8)	.	11·1(11)	.	.	.	.	.	.
,, 26*	.	.	.	.	.	.	10·0	10·6	10·6	.	10·5	.
,, 27*	10·7	10·6	10·7	.	10·7	.	.	.	.	.	.	.
,, 28*	.	.	.	.	.	.	10·0	10·6	10·7	.	10·5	.
,, 29*	7·0	10·7	10·6	.	10·7	.	7·8	10·4	10·4‡	10·5(8)	10·6	.
,, 30*	8·3	10·6	10·6‡	10·5(8)	.	10·7(11)	7·0	10·4	10·6	10·5(8)	10·7	.
,, 31*	7·2	10·2	10·4‡	10·4(8)	.	10·6(11)	.	.	.	.	.	.

† 6°·9 at 3 fathoms. ‡ At 4 fathoms.

ROTHESAY BAY—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms	10 fms.	10–15 fathoms.	Over 15 fms.	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.
Nov. 4*	5·7	8·1	8·3	7·3	7·6(13)	.	9·6	9·6	10·1	10·0	10·2(14)	.
,, 5*	8·3	9·3	9·7	10·1	10·1(13)	.	9·7	9·4	9·6	10·0	10·1(14)	
,, 6*	8·3	9·3	9·3	10·0	10·0(13)	.	7·2	9·0	9·2	9·9	10·0(14)	.
,, 7*	9·6	9·3	9·3	9·4	9·4(13)	.	9·6	9·3	9·3	9·3	9·7(14)	.
,, 8*	9·3	9·1	9·2	9·4	9·6(13)	.	.	.	.	.	.	.
,, 11*	9·4	8·5	8·6	9·9	10·0(14)	.	7·9	8·5	8·7	9·9	9·9(13)	.
,, 12*	7·2	8·4	9·1	9·8	10·1(14)	.	6·6	8·5	9·6	9·9	10·1(12)	.
,, 13*	6·2	8·4	9·0	9·7	10·4(14)	.	6·6	8·5	9·7	11·3	10·4(13)	.
,, 14*	4·2	8·3	8·5	10·1	10·4(14)	.	3·3	8·4	8·3	10·1	10·5(13)	.
,, 17*	.	.	.	.	.	.	7·6	9·1	10·0	10·1	10·4(15)	.
,, 18*	7·2	9·7	10·3	10·2	10·2(13)	.	6·1	10·0	10·2	10·1	10·5(14)	.
,, 19*	4·4	9·4	9·4	9·5	10·4(13)	.	5·4	9·0	9·4	9·4	10·0(14)	.
,, 20*	3·3	8·2	8·8	8·8	9·7(13)	.	4·5	8·4	9·3	9·0	10·1(14)	.
,, 21*	3·9	8·4	8·3	8·9	9·9(13)	.	.	.	.	.	.	.
,, 24*	6·8	8·5	8·7	9·1	9·4(15)	9·7(16)	6·7	8·9	9·6	9·6	10·5(15)	.
,, 25*	5·5	8·8	8·8	9·6	10·5(14)	10·7(16)	7·1	8·8	8·7	8·9	9·0(15)	.
,, 26*	10·7	10·0	9·9	10·0	.	10·0(16)	9·5	9·6	9·6	9·7	10·0(15)	.
,, 27*	6·1	9·0	9·1	9·2	9·3(14)	9·6(16)	6·2	9·0	9·3	9·1	9·6(15)	.
,, 28*	5·6	8·5	9·4	9·5	9·8(14)	10·0(16)	6·7	9·0	9·4	9·6	9·6(15)	.
,, 29*	5·0	8·7	9·1	9·6	9·7(14)	9·8(16)	.	.	.	.	.	.
Dec. 2*	9·5	9·0	9·0	9·2	9·4(14)	.	9·9	9·1	9·1	9·3	9·3(14)	.
,, 3*	10·5	9·3	9·3	9·3	9·4(14)	.	9·5	9·1	9·2	9·2	9·2(14)	.
,, 4*	3·3	9·0	9·0	9·0	9·0(13)	.	4·7	9·0	9·0	9·0	9·4(14)	.
,, 8*	.	.	.	.	.	.	2·9	7·8	8·0	8·4	8·8(14)	.
,, 9*	4·5	7·8	7·9	8·7	9·0(14)	.	3·3	7·4	8·0	8·7	9·0(14)	.
,, 10*	1·1	6·9	8·5	9·0	9·0(14)	.	−0·3	6·8	8·4	9·0	9·3(14)	.
,, 11*	−0·9	6·6	8·2	8·9	9·3(14)	.	3·3	7·7	8·3	8·7	9·1(13)	.
,, 12*	0·5	6·6	8·9	9·0	9·4(14)	.	.	.	.	.	.	.
,, 16*	7·8	7·4	8·0	8·7	9·0(14)	.	7·2	7·3	7·6	8·1	8·8(14)	.
,, 17*	5·7	7·1	7·2	7·8	8·8(13)	.	5·6	7·2	7·9	8·0	8·5(14)	.
,, 18*	1·8	7·5	7·7	8·0	8·5(13)	.	0·8	7·3	7·6	7·8	8·5(14)	.
,, 19*	4·0	6·3	6·9	7·7	8·4(13)	.	.	.	.	.	.	.
,, 20*	.	.	.	.	.	.	3·8	6·0	7·0	7·7	8·4(13)	.
,, 21*	1·7	6·4	7·4	8·0	8·4(12)	.	.	.	.	.	.	.
,, 23*	.	.	.	.	.	.	5·6	5·7	8·3	8·3	8·7(13)	.
,, 24*	.	.	.	.	.	.	6·1	6·3	7·1	7·3	.	.
,, 25*	5·6	5·2	7·2	.	8·2(11)	.	6·6	5·7	8·2	8·7	.	.
,, 26*	2·5	5·7	8·3	8·5	8·7(12)	.	3·7	5·7	8·2	8·7	.	.
,, 27*	1·6	5·5	7·6	.	8·7(11)	.	1·6	5·1	8·3	8·3	.	.
,, 28*	4·5	5·4	7·2	.	8·5(11)	.	5·0	5·6	6·6	8·4	.	.
,, 29*	3·7	5·7	8·0	8·4	8·5(11)	.	2·4	5·5	7·8	.	8·4(11)	.
,, 30*	−0·2	5·2	7·6	8·3	8·4(11)	.	3·0	5·3	8·3	.	8·6(11)	.
,, 31*	3·7	5·3	7·8	.	8·4(11)	.	4·3	4·7	8·3	.	8·3(11)	.
1888.												
Jan. 1*	2·8	7·5	8·3	8·3	.	.	1·7	8·2	8·3	8·4	8·3(11)	.
,, 2*	0·3	7·9	7·9	8·2	.	.	4·4	7·7	7·8	7·9	7·9(11)	.
,, 3*	3·7	7·5	7·8	.	8·0(11)	.	3·9	7·2	7·8	7·9	7·9(12)	.
,, 4*	8·6	8·1	8·0	.	8·2(11)	.	7·4	8·1	7·9	7·9	8·0(12)	.
,, 5*	.	.	.	.	.		6·5	7·9	7·9	8·0	8·0(12)	.
,, 6*	7·2	7·4	7·3	7·6	7·9(15)	8·0(18)	.	.	.	.	.	.
,, 14*	5·7	7·7	7·2	7·4	7·5(12)	.	5·6	6·5	7·3	7·3	7·2(12)	.
,, 15*	3·9	5·8	6·7	.	7·8(11)	.	.	.	.	.	.	.
,, 20*	4·5	6·6	7·2	7·4	7·6(13)	.	5·2	6·7	6·9	7·4	7·7(14)	.
,, 21*	4·1	6·6	6·8	7·4	7·6(13)	.	5·2	6·2	7·3	7·4	7·6(14)	.
,, 23*	5·8	6·9	7·2	7·3	7·6(14)	.	6·1	7·2	7·2	7·6	7·6(13)	.
,, 28*	0·3	5·5	7·1	7·3	.	.	4·6	5·5	7·6	7·3	.	.
,, 30*	3·3	4·9	7·2	7·3	.	.	5·3	4·6	7·2	7·2	.	.
Feb. 4*	7·2	6·5	6·6	7·2	7·2(12)	.	8·7	7·2	6·8	7·1	7·0(13)	.
,, 6*	7·9	7·1	7·0	7·1	7·0(12)	.	.	.	.	.	.	.
,, 7*	.	.	.	.	.	.	8·4	7·0	7·1	7·1	7·1(12)	.
,, 10*	.	.	.	.	.	.	2·7	6·9	7·0	7·1	7·1(12)	.
,, 11*	0·6	6·7	7·1	7·1	7·1(12)	.	−0·4	6·5	7·0	7·1	7·1(12)	.
,, 13*	1·1	5·2	6·7	7·0	7·0(12)	.	2·7	5·7	6·2	6·9	7·0(12)	.
,, 14*	2·4	5·1	6·5	6·9	6·9(11)	.	.	.	.	.	.	.
,, 20*	.	.	.	.	.	.	4·6	4·7	5·0	6·2	6·7(13)	.
,, 21*	2·9	4·0	5·9	6·6	6·7(13)	.	.	.	.	.	.	.
,, 24*	2·0	5·1	5·5	5·7	6·5(12)	.	2·2	5·0	5·4	6·0	6·4(11)	.
,, 25*	.	.	.	.	.	.	3·5	5·0	5·4	6·1	6·5(11)	.
,, 27*	4·4	4·9	5·2	5·6	5·7(11)	.	4·6	5·7	5·6	5·7	.	5·6(16)
Mar. 1*	2·8	5·0	5·0	6·1	6·1(12)	.	5·7	5·0	5·5	6·3	6·3(14)	.
,, 2*	4·4	5·0	5·1	6·2	6·5(12)	.	.	.	.	.	.	.
,, 3*	1·1	5·0	5·3	5·8	6·5(12)	.	4·0	5·2	5·6	6·2	6·1(14)	.
,, 5*	1·6	5·2	6·1	6·2	6·1(12)	.	5·2	5·9	6·1	6·2	6·1(14)	.
,, 6*	6·5	6·0	6·1	6·2	6·1(13)	.	.	.	.	.	.	.
,, 8*	.	.	.	.	.	.	9·4	6·4	6·3	6·5	6·5(12)	.
,, 9*	7·7	6·3	6·2	6·3	6·5(14)	.	.	.	.	.	.	.
May 1*	9·0	6·6	6·5	6·3	6·2(13)	.	.	.	.	.	.	.
,, 8*	.	.	.	.	.	.	8·1	7·3	7·3	.	7·3(11)	.

4. ROTHESAY BAY—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.
1888.												
May 11*	.	.	.	.	.	. .	8·3	7·3	.	6·9	6·8(12)	.
,, 12*	9·0	8·3	7·2	.	6·8(12)	. .	.	.	.	.	.	.
,, 14*	8·3	7·6	7·2	.	7·3(11)	. .	11·7	7·8	7·2	6·9	6·9(12)	.
,, 15*	6·7	7·3	6·9	.	6·7(11)	. .	9·8	7·2	6·9	6·8	6·6(12)	.
Oct. 2*	6·1	10·7	10·7	10·7	10·7(12)	. .	10·9	10·8	10·8	10·8	10·8(11)	.
,, 3*	7·9	10·6	10·7	10·7	10·7(12)	. .	.	.	.	.	.	.
,, 4*	7·4	10·3	10·7	10·7	10·7(12)	. .	7·0	10·5	10·6	10·5	10·5(11)	.
,, 5*	7·8	10·1	10·2	10·2	10·2(11)	. .	8·3	10·2	10·2	10·5	10·5(11)	.
,, 6*	6·7	10·3	10·4	10·4	10·4(11)	. .	7·6	10·1	10·4	10·6	10·7(11)	.
,, 7*	4·9	10·5	10·4	10·4	10·5(11)	. .	11·1	10·4	10·2	10·2	10·2(11)	.
,, 8*	10·1	10·4	10·4	10·5	.	. .	.	.	.	.	.	.
,, 13*	8·3	10·4	10·4	10·4	10·4(12)	. .	8·4	10·2	10·4	10·4	10·4(12)	.
,, 14*	8·5	10·0	10·0	10·0	10·0(12)	. .	10·4	10·1	10·0	10·1	10·0(11)	.
,, 15*	10·1	10·1	10·1	10·0	10·0(13)	. .	11·3	10·1	10·1	10·1	10·1(11)	.
,, 16*	10·8	10·1	10·1	10·1	10·1(13)	. .	.	.	.	.	.	.
,, 19*	.	.	.	.	.	. .	11·5	10·1	10·1	10·1	10·1(12)	.
,, 20*	10·3	10·1	10·1	10·1	10·1(12)	. .	.	.	.	.	.	.
,, 21*	10·5	10·1	10·1	10·1	10·1(12)	. .	12·1	10·2	10·2	10·1	10·1(12)	.
,, 22*	7·8	10·0	10·1	10·1	10·1(11)	. .	10·0	10·1	10·1	10·1	10·1(12)	.
,, 23*	10·1	9·9	10·1	10·1	10·1(11)	. .	12·3	10·1	10·0	10·0	10·1(12)	.
,, 24*	10·0	10·0	10·1	10·1	10·1(12)	. .	10·6	10·1	10·1	10·1	10·1(13)	.
,, 25*	12·3	10·1	10·1	10·1	10·1(11)	. .	12·8	10·2	10·1	10·1	10·1(13)	.
,, 26*	14·5	10·2	10·2	10·1	10·1(11)	. .	13·9	10·4	10·4	10·2	10·1(13)	.
,, 27*	14·5	10·4	10·3	10·2	10·1(11)	. .	14·4	10·4	10·2	10·1	10·1(13)	.
,, 28*	13·3	10·4	10·3	10·2	10·2(13)	. .	13·8	10·5	10·5	10·2	10·2(13)	.
,, 29*	10·6	10·4	10·3	10·3	10·3(13)	. .	.	.	.	.	.	.
Nov. 15*	12·6	9·0	9·1	9·1	9·1(13)	. .	10·7	9·1	9·3	9·6	.	.
,, 16*	11·8	9·6	9·6	9·7	9·7(13)	. .	10·2	9·6	9·6	9·7	9·8(13)	.
,, 17*	8·0	9·4	9·4	9·6	9·7(13)	. .	8·0	9·2	9·2	9·4	9·4(12)	.
,, 18*	9·2	8·7	9·3	9·4	9·6(13)	. .	11·1	9·1	9·3	9·4	9·4(12)	.
,, 19*	11·2	9·5	9·5	9·6	9·7(12)	. .	10·0	9·5	9·5	9·6	9·6(12)	.
,, 23*	.	.	.	.	.	. .	8·9	9·3	9·5	9·6	9·7(13)	.
,, 24*	8·4	9·6	9·6	10·0	10·0(12)	. .	8·4	9·6	9·6	9·6	9·7(13)	.
,, 25*	13·0	9·6	9·7	10·0	10·0(12)	. .	9·8	9·5	9·6	9·9	10·0(13)	.
,, 26*	7·7	8·9	9·1	9·4	9·6(12)	. .	3·8	8·9	9·0	9·3	9·6(13)	.
,, 27*	4·0	7·4	8·4	8·9	9·0(13)	. .	.	.	.	.	.	.
Dec. 1*	.	.	.	.	.	. .	8·2	8·3	9·1	9·6	9·7(12)	.
,, 2*	8·2	7·6	9·5	9·6	9·9(13)	. .	9·4	7·9	9·4	9·6	9·6(12)	.
,, 3*	10·9	9·3	9·3	9·6	9·6(13)	. .	.	.	.	.	.	.
,, 4*	9·1	9·0	9·4	9·5	9·5(13)	. .	.	.	.	.	.	.
,, 7*	.	.	.	.	.	. .	11·7	9·0	9·1	9·3	9·5(13)	.
,, 8*	6·4	8·3	9·0	9·5	9·6(11)	. .	.	.	.	.	.	.
,, 9*	.	.	.	.	.	. .	7·2	8·2	9·0	9·3	9·6(13)	.
,, 10*	2·9	6·2	9·1	9·3	9·6(12)	. .	5·6	7·5	8·0	9·0	9·4(12)	.
,, 11*	4·6	6·9	9·2	9·5	9·6(12)	. .	.	.	.	.	.	.
,, 15*	2·6	6·9	7·1	7·3	7·4(13)	. .	7·4	7·2	8·0	9·0	9·0(12)	.
,, 16*	7·6	6·1	8·3	8·9	9·0(12)	. .	10·2	9·6	9·6	9·7	9·8(13)	.
,, 17*	8·0	9·4	9·4	9·6	9·7(13)	. .	8·0	9·2	9·2	9·4	9·4(12)	.
,, 22*	.	.	.	.	.	. .	8·9	7·8	8·0	8·2	9·0(12)	.
,, 24*	6·1	7·4	7·8	8·3	9·0(11)	. .	.	.	.	.	.	.
,, 29*	3·5	6·7	6·9	8·4	8·4(15)	. .	.	.	.	.	.	.
1889.												
Jan. 2*	0·0	5·4	7·2	8·2	8·4(12)	. .	.	.	.	.	.	.
,, 5*	.	.	.	.	.	. .	6·6	7·6	7·9	8·3	8·4(13)	.
,, 7*	2·1	5·5	6·6	8·0	8·0(13)	. .	.	.	.	.	.	.
,, 18*	.	.	.	.	.	. .	7·2	7·4	7·7	7·7	7·8(13)	.
,, 21*	7·8	6·8	7·2	7·4	7·7(12)	. .	.	.	.	.	.	.
,, 30*	5·6	7·6	7·8	7·8	7·8(13)	. .	.	.	.	.	.	.
Feb. 1*	.	.	.	.	.	. .	9·6	7·7	7·7	7·8	8·0(15)	.
,, 2*	1·6	7·2	7·3	7·4	7·4(12)	. .	2·4	7·2	7·2	7·2	7·3(13)	.
,, 4*	.	.	.	.	.	. .	6·1	6·3	7·2	7·2	7·2(13)	.
,, 5*	.	.	.	.	.	. .	8·2	6·5	6·5	7·2	7·3(13)	.
,, 15*	9·4	5·8	6·3	6·6	6·7(11)	. .	4·8	5·6	6·1	6·1	6·1(11)	.
,, 16*	4·7	6·2	6·2	6·2	6·2(11)	. .	.	.	.	.	.	.
,, 18*	.	.	.	.	.	. .	10·5	6·8	6·8	7·0	7·1(12)	.
,, 19*	7·2	6·8	6·8	6·8	6·8(11)	. .	.	.	.	.	.	.
,, 25*	4·4	5·6	6·7	6·8	6·8(13)	. .	.	.	.	.	.	.
Mar. 1*	3·9	5·1	5·7	6·6	6·7(13)	. .	2·7	5·0	5·9	6·6	6·7(12)	.
,, 4*	−0·8	4·4	4·4	6·7	6·7(12)	. .	.	.	.	.	.	.
,, 8*	2·7	4·5	5·7	6·1	6·3(12)	. .	.	.	.	.	.	.
,, 9*	.	.	.	.	.	. .	5·7	5·7	6·1	6·8	6·8(13)	.
,, 11*	4·5	6·4	6·6	6·8	6·8(12)	. .	.	.	.	.	.	.
,, 15*	.	.	.	.	.	. .	5·9	6·2	6·8	6·8	6·9(12)	.
,, 16*	.	.	.	.	.	. .	10·8	6·0	6·8	6·9	6·9(12)	.
,, 24*	.	.	.	.	.	. .	10·0	6·9	6·9	6·9	7·1(13)	.
,, 25*	.	.	.	.	.	. .	6·1	6·9	6·9	6·7	6·7(12)	.
Apr. 29*	.	.	.	.	.	. .	9·0	7·7	7·4	7·2	7·1(12)	.
July 1*	14·7	12·2	10·4	9·1	8·6(12)	. .	16·0	12·6	10·7	9·0	8·7(13)	.

4. ROTHESAY BAY—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.
1889.												
July 12*	11·7	11·0	10·1	9·8	9·6(12)	. .	15·7	11·7	10·1	9·2	8·8(12)	.
,, 15*	13·9	10·7	10·0	9·0	8·7(12)	. .	.	.	.	.	.	.
Sept. 16*	.	.	.	.	.	. .	14·9	12·9	12·8	12·7	12·6(13)	.
,, 23*	.	.	.	.	.	. .	10·6	12·1	11·9	11·8	11·8(12)	.
,, 24*	8·3	11·7	12·0	11·9	11·8(13)	. .	.	.	.	.	.	.
Oct. 1*	11·1	11·2	11·2	11·3	11·3(11)	. .	.	.	.	.	.	.
,, 5*	.	.	.	.	.	. .	11·4	11·2	11·2	11·2	11·2(15)	.
,, 7*	9·4	11·2	11·2	11·2	11·2(15)	. .	10·0	11·1	11·2	11·2	11·2(12)	.
,, 8*	8·9	10·9	10·9	11·0	11·0(13)	. .	.	.	.	.	.	.
,, 18*	10·4	10·4	10·7	11·1	11·2(12)	. .	.	.	.	.	.	.
,, 19*	10·2	10·4	10·5	10·8	11·2(12)	. .	.	.	.	.	.	.
,, 25*	.	.	.	.	.	. .	9·1	9·8	10·7	11·1	11·2(12)	.
,, 28*	7·2	9·6	10·2	11·1	11·2(12)	. .	.	.	.	.	.	.
,, 31*	.	.	.	.	.	. .	10·7	10·2	10·5	10·7	10·8(12)	.
Nov. 4*	7·1	9·9	10·0	10·0	10·0(13)	. .	.	.	.	.	.	.
,, 8*	.	.	.	.	.	. .	9·7	10·2	10·2	10·2	10·7(13)	.
,, 9*	11·0	10·2	10·2	10·5	10·7(12)	. .	.	.	.	.	.	.
,, 11*	9·9	10·1	10·4	10·5	10·8(12)	. .	.	.	.	.	.	.
,, 12*	10·8	10·2	10·4	10·5	10·7(12)	. .	.	.	.	.	.	.
,, 16*	.	.	.	.	.	. .	8·2	9·6	10·2	10·4	10·4(12)	.
,, 18*	.	.	.	.	.	. .	10·2	9·4	10·0	10·1	10·3(12)	.
,, 25*	4·5	9·6	9·9	10·1	10·2(12)	. .	.	.	.	.	.	.
,, 30*	6·7	9·7	9·9	10·0	10·1(12)	. .	.	.	.	.	.	.
Dec. 2*	9·9	9·9	10·0	10·0	10·1(13)	. .	.	.	.	.	.	.
,, 3*	6·4	9·6	9·9	9·9	9·9(13)	. .	.	.	.	.	.	.
,, 6*	6·1	8·2	8·3	8·5	8·6(13)	. .	.	.	.	.	.	.
,, 10*	4·5	8·1	9·3	9·4	9·6(12)	. .	4·7	8·2	8·3	8·3	8·6(13)	.
,, 11*	2·8	6·9	7·7	8·4	8·4(12)	. .	.	.	.	.	.	.
,, 14*	5·8	7·2	8·4	9·0	9·1(12)	. .	.	.	.	.	.	.
,, 16*	8·0	8·7	9·0	9·2	9·2(13)	. .	.	.	.	.	.	.
,, 20*	3·0	8·1	8·3	8·4	8·5(12)	. .	.	.	.	.	.	.
1890.												
Jan. 6*	.	.	.	.	.	. .	9·4	7·5	7·8	8·3	8·3(12)	.
,, 7*	6·1	7·9	8·1	8·2	8·3(12)	. .	.	.	.	.	.	.
,, 8*	8·5	7·4	7·9	7·9	8·0(12)	. .	9·0	7·3	7·8	7·9	8·2(13)	.
,, 18*	.	.	.	.	.	.	4·0	7·3	7·3	7·3	7·4(11)	.
,, 20*	.	.	.	.	.	.	3·2	6·9	6·9	7·4	7·6(12)	.
,, 21*	4·6	6·9	7·2	7·4	7·6(12)	.	.	.	.	.	.	.
,, 25*	.	.	.	.	.	.	8·3	7·9	7·9	7·9	8·0(13)	.
,, 27*	5·4	6·5	6·6	7·5	8·0(12)	.	5·6	6·5	6·6	7·6	8·0(13)	.
Feb. 1*	8·7	7·3	7·4	7·4	7·6(13)	.	.	.	.	.	.	.
,, 10*	.	.	.	.	.	.	4·3	6·0	6·8	7·4	7·7(13)	.
,, 11*	3·4	5·6	6·8	7·4	7·4(11)	.	.	.	.	.	.	.
,, 14*	.	.	.	.	.	.	3·3	5·2	5·7	7·4	.	.
,, 15*	1·9	4·3	5·2	7·2	7·3	.	.	.	.	.	.	.
,, 27*	3·3	5·9	6·7	7·0	7·1	.	3·8	6·0	6·9	7·0	7·1(12)	.
Mar. 25*	5·8	6·7	6·8	6·8	.	.	7·2	6·9	6·8	6·8	6·8(11)	.
,, 26*	8·8	6·9	6·9	6·9	.	.	.	.	.	.	.	.
,, 29*	.	.	.	.	.	.	10·7	7·2	7·2	7·0	7·0(12)	.
Apr. 8*	7·8	7·3	7·3	7·2	7·2(11)	.	8·7	7·4	7·3	7·2	7·2	.
,, 19*	6·1	7·1	7·1	7·1	7·1(12)	.	.	.	.	.	.	.
,, 30*	7·6	7·9	7·7	7·4	7·2(12)	.	.	.	.	.	.	.
May 12*	14·0	9·1	8·5	7·7	7·3(12)	.	.	.	.	.	.	.
,, 17*	11·1	8·8	8·7	8·9	7·9(13)	.	.	.	.	.	.	.
,, 19*	11·1	9·4	9·1	9·0	8·8(12)	.	.	.	.	.	.	.
Sept. 20*	14·0	13·5	13·4	12·7	12·3(12)	.	12·7	13·4	13·4	12·7	12·3(13)	.
,, 22*	14·5	13·3	13·1	13·2	12·7(12)	.	.	.	.	.	.	.
,, 26*	.	.	.	.	.	.	15·6	13·2	13·2	12·9	12·6(13)	.
,, 27*	14·9	13·3	13·3	12·9	12·5(15)	.	14·1	13·2	13·6	12·5	12·3(13)	.
,, 29*	12·6	13·1	13·0	12·4	12·4(14)	.	.	.	.	.	.	.
Oct. 4*	12·7	12·3	12·3	12·3	12·3(12)	.	.	.	.	.	.	.
,, 6*	10·4	12·4	12·5	12·6	12·4(12)	.	.	.	.	.	.	.
,, 10*	11·5	12·3	12·3	12·3	12·2(14)	.	14·8	12·5	12·5	12·3	12·2(12)	.
,, 11*	13·5	12·6	12·6	12·6	12·3(13)	.	.	.	.	.	.	.
,, 13*	12·2	12·6	12·6	12·6	12·3(13)	.	.	.	.	.	.	.
,, 25*	.	.	.	.	.	.	7·4	11·2	11·2	11·5	12·2(12)	.
,, 27*	4·4	11·0	11·2	11·5	12·1(13)	.	.	.	.	.	.	.
Nov. 1*	9·4	10·8	11·1	11·6	11·8(12)	.	.	.	.	.	.	.
,, 3*	.	.	.	.	.	.	6·1	10·8	11·0	11·2	11·8(13)	.
,, 22*	7·8	9·6	10·8	11·0	11·1(13)	.	.	.	.	.	.	.
Dec. 2*	9·5	8·6	9·4	10·3	10·7(13)	.	.	.	.	.	.	.
,, 20*	.	.	.	.	.	.	4·1	7·8	8·4	8·4	8·5(15)	.
,, 25*	5·5	7·2	7·5	7·8	9·0(14)	.	.	.	.	.	.	.
,, 26*	3·8	7·2	7·4	7·8	9·0(14)	.	.	.	.	.	.	.
1891.												
Jan. 8*						.	3·4	7·8	8·7	8·7	8·8(13)	.
,, 9*	3·3	7·9	7·9	8·1	8·7(14)	.	.	.	.	.	.	.
,, 10*	3·3	9·2	7·2	7·6	7·6(14)	.	.	.	.	.	.	.

4. ROTHESAY BAY—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.	Air.	Surf.	5 fms.	10 fms.	10–15 fathoms.	Over 15 fms.
1891.												
Jan. 12*	7·7	7·2	7·2	7·7	7·8(13)	. .	.	.	.	.	.	.
,, 17*	2·4	7·0	7·2	7·2	7·3(14)	. .	.	.	.	.	.	.
,, 21*	.	.	.	.	.	. .	2·3	6·8	6·9	7·1	7·0(13)	.
,, 22*	.	.	.	.	.	. .	3·4	9·5	6·8	6·9	7·0(13)	.
,, 28*	5·5	6·8	6·8	7·0	7·1(13)	. .	.	.	.	.	.	.
Feb. 9*	1·8	6·2	6·6	6·9	6·8(13)	. .	.	.	.	.	.	.
,, 10*	5·4	6·2	6·7	6·3	6·4(13)	. .	.	.	.	.	.	.
,, 19*	.	.	.	.	.	. .	8·2	6·5	6·7	6·8	6·9(13)	.
,, 20*	4·5	4·9	6·6	6·7	7·0(13)	. .	.	.	.	.	.	.
,, 21*	4·0	6·1	6·8	6·7	6·8(13)	. .	.	.	.	.	.	.
Mar. 14*	2·9	5·5	6·1	6·5	6·7(12)	. .	.	.	.	.	.	.
,, 16*	4·1	6·2	6·1	6·4	6·5(12)	. .	.	.	.	.	.	.
,, 17*	.	.	.	.	.	. .	4·5	6·1	6·6	6·6	6·6(13)	.
,, 18*	.	.	.	.	.	. .	7·9	6·0	6·1	6·1	6·1(13)	.
Apr. 27*	9·3	6·9	6·6	6·4	6·4(12)	. .	10·9	7·2	6·9	6·5	6·5(13)	.
,, 28*	8·8	7·1	7·2	7·0	6·8(12)	. .	.	.	.	.	.	.
,, 29*	7·0	7·3	7·1	6·9	6·8(12)	. .	5·2	7·2	7·1	6·9	6·8(13)	.
,, 30*	10·3	7·2	7·2	7·0	6·9(13)	. .	.	.	.	.	.	.
May 4*	9·4	7·5	7·4	6·6	6·6(13)	. .	12·7	8·5	6·8	6·6	6·6(11)	.
,, 8*	7·3	7·8	7·7	6·5	6·5(13)	. .	.	.	.	.	.	.
Sept. 23*	.	.	.	.	.	. .	13·2	12·6	12·6	12·5	12·2(13)	.
,, 24*	13·0	12·4	12·6	12·2	12·2(12)	. .	.	.	.	.	.	.
,, 25*	13·5	12·3	12·6	12·2	12·2(12)	. .	.	.	.	.	.	.
Oct. 3*	.	.	.	.	.	. .	14·4	12·2	12·2	12·2	12·1(13)	.
,, 5*	12·8	12·2	12·2	12·2	12·2(13)	. .	.	.	.	.	.	.
,, 10*	12·3	11·8	11·9	12·2	12·1(12)	. .	.	.	.	.	.	.
,, 17*	10·2	10·6	10·9	11·6	11·9(13)	. .	9·7	10·7	11·5	11·8	12·0(13)	.
,, 19*	8·3	11·0	11·0	11·4	11·8(13)	. .	.	.	.	.	.	.
,, 30*	.	.	.	.	.	. .	8·4	8·8	10·0	10·7	11·0(11)	.
,, 31*	8·3	10·5	11·3	11·3	11·2(12)	. .	9·1	10·5	11·4	11·3	11·0(11)	.
Nov. 7*	9·1	10·8	11·5	11·2	11·2(12)	. .	.	.	.	.	.	.
,, 12*	9·4	10·1	10·3	10·7	11·1(13)	.	.	.	.	.	.	.
,, 17*	5·8	9·0	9·9	10·1	10·2(12)	. .	.	.	.	.	.	.
Dec. 1*	9·5	9·1	9·9	10·0	10·0(12)	. .	.	.	.	.	.	.
,, 24*	1·9	5·5	8·3	8·5	8·7(12)	. .	.	.	.	.	.	.
,, 30*	5·5	6·9	7·1	8·9	9·0(12)	. .	.	.	.	.	.	.

5. FAIRLIE ROADS.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1888.												
Oct. 17*	11·1	10·7	10·7	10·7(9)	.	. .	12·1	10·7	10·7	10·7(8)	.	.
Dec. 20*	6·5	7·2	7·7	.	8·0	. .	6·5	7·4	7·6	7·8(9)	.	.
1889.												
Feb. 8*	3·3	6·6	6·6	6·6(7)	.	. .	4·1	6·6	6·6	6·6(7)	.	.
,, 22*	6·1	6·3	6·5	6·6(9)	.	. .	.	.	.	.	.	.
Oct. 9*	6·7	11·0	10·9	.	11·0	11·0(13)	10·4	10·9	10·9	.	11·0	11·0(12)
Nov. 19*	.	.	.	.	.	. .	11·1	10·0	10·1	10·1(8)	.	.
,, 20*	.	.	.	.	.	. .	9·1	9·9	9·9	10·0(8)	.	.
1890.												
Jan. 9*	.	.	.	.	.	. .	7·2	7·3	7·3	7·4(8)	.	.
,, 17*	8·5	7·7	7·7	.	7·7	.	.	.	.	.	.	.
Feb. 20*	.	.	.	.	.	.	3·3	6·1	6·2	6·3(8)	.	.
,, 21*	3·4	6·1	6·2	6·2(7)	.	. .	.	.	.	.	.	.
Nov. 17*	.	.	.	.	.	. .	10·0	9·8	10·7	10·7(8)	.	.
,, 18*	10·1	9·9	10·5	11·0(7)	.	. .	11·1	9·8	10·2	10·9(8)	.	.
Dec. 9*	.	.	.	.	.	. .	3·2	6·2	9·0	9·6(9)	.	.
,, 11*	.	.	.	.	.	. .	7·2	9·0	9·0	9·6(9)	.	.
,, 12*	6·9	9·0	9·0	9·6(9)	.	. .	.	.	.	.	.	.
,, 22*	.	.	.	.	.	. .	2·2	8·0	8·4	8·5(7)	.	.
1891.												
Sept. 9*	.	.	.	.	.	. .	15·0	12·6	12·6	12·6(7)	.	.
Oct. 29*	.	.	.	.	.	. .	9·3	8·9	11·3	.	12·2	12·3(11)
Nov. 12*	.	.	.	.	.	. .	8·4	9·6	9·6	9·5(7)	.	.
,, 13*	8·0	9·6	9·6	9·6(8)	.	. .	7·8	9·6	9·6†	9·7(7)	.	.
,, 27*	2·0	7·8	9·6	10·1(7)	.	.	5·1	7·9	9·5	10·1(7)	.	.
Dec. 15*	.	.	.	.	.	. .	4·5	8·5	8·9	8·9(8)	.	.

† Reading at 3 fathoms.

6. OFF GREENOCK.

Date.	9 A.M.						3 P.M					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms	Over 10 fms.
1887.												
May 18*	.	.	.	.	.	.	11·9	11·0	9·3	.	8·4	7·1(15)
„ 19*	9·4	9·8	9·6	.	7·6	7·2(15)	10·5	11·1	10·7	.	7·4	7·2(15)
„ 20*	7·2	9·4	7·7	.	7·2	7·0(15)	8·2	10·1	9·2	.	7·6	7·1(15)
„ 21*	5·9	9·0	8·2	.	7·9	7·3(15)	8·6	9·4	8·8	.	8·1	7·9(15)
„ 22*	8·8	8·9	8·0	.	7·5	7·2(15)	10·4	9·5	9·0	.	8·2	8·2(15)
„ 23*	9·0	9·1	8·2	.	7·6	7·1(15)	13·3	9·6	8·3	.	8·0	7·1(15)
„ 24*	11·3	8·8	8·4	.	7·6	7·3(15)	15·3	9·9	9·6	.	7·7	7·2(15)
„ 25*	15·0	9·3	8·3	.	7·3	7·2(15)	14·9	9·5	7·2	.	7·2	7·2(15)
Oct. 18*	.	.	.	.	.	.	11·4	11·2	11·2	.	11·2	11·3(15)
Nov. 9*	7·8	9·5	10·1	.	10·2	10·2(15)	8·0	9·4	10·2	.	10·2	10·2(15)
Dec. 5*	.	.	.	.	.	.	7·1	8·6	8·7	.	9·0	9·1(16)
„ 6*	6·1	8·3	8·4	.	8·9	9·0(16)	.	.	.	.	.	.
1888.												
Jan. 6*	.	.	.	.	.	.	9·0	6·6	7·5	.	7·7	7·5(15)
„ 7*	9·0	6·2	7·2	.	7·3	7·3(15)	7·9	6·4	7·2	.	7·3	7·4(15)
„ 8*	10·0	6·8	7·2	.	7·2	7·4(15)	9·8	6·9	7·1	.	7·2	7·3(14)
„ 9*	8·3	6·8	6·8	.	6·9	6·9(15)	.	.	.	.	.	.
Feb. 6*	.	.	.	.	.	.	9·3	6·7	6·7	.	6·8	7·0(13)
„ 7*	7·2	6·5	6·6	.	6·9	6·9(14)	.	.	.	.	.	.
Mar. 9*	.	.	.	.	.	.	8·6	6·2	6·2	6·3(9)	.	.
„ 10*	8·6	6·6	6·4	.	6·5	.	.	.	.	.	.	.
May 2*	5·6	7·1	6·7	.	6·7	.	10·2	7·1	6·7	.	6·7	.
„ 3*	6·3	7·1	7·1	.	6·9	.	.	.	.	.	.	.
„ 5*	6·3	7·3	7·2	.	.	7·1(11)	9·7	7·5	7·1	7·0(9)	.	.
„ 7*	10·5	7·6	7·1	.	.	6·7(11)	10·2	8·3	7·6	.	6·7	.
Oct. 9*	10·2	9·9	10·2	.	10·4	10·4(12)	11·6	10·5	10·2	.	10·4	10·5(15)†
„ 29*	.	.	.	.	.	.	11·0	11·1	11·0	.	11·0	.
Dec. 5*	.	.	.	.	.	.	12·0	9·1	9·1	9·1(8)	.	.
„ 6*	10·8	8·9	9·0	9·0(7)	.	.	11·7	9·0	9·3	9·3(8)	.	.
1889.												
Jan. 25*	.	.	.	.	.	.	7·9	7·2	7·3	7·6(9)	.	.
„ 26*	7·0	6·9	7·1	.	7·4	.	6·5	6·3	7·1	7·7(9)	.	.
„ 28*	7·7	7·1	7·2	.	7·4	7·6(11)	8·3	7·2	7·4	7·6(9)	.	.
„ 29*	7·2	7·2	7·2	.	7·4	7·4(11)	.	.	.	.	.	.
Feb. 20*	.	.	.	.	.	.	6·3	6·3	6·8	6·8(8)	.	.
Oct. 2*	.	.	.	.	.	.	12·6	11·2	11·8	.	11·8	.
„ 3*	.	.	.	.	.	.	11·2	11·2	11·5	11·6(9)	.	.
„ 30*	11·1	10·5	10·1	.	10·1	10·1(12)	–	.	.	.	.	.
Nov. 12*	.	.	.	.	.	.	11·3	10·1	10·1	10·2(8)	.	.
„ 13*	.	.	.	.	.	.	9·2	10·0	10·2	.	.	10·3(12)
Dec. 6*	.	.	.	.	.	.	6·1	8·1	8·1	7·1(9)	.	.
„ 7*	5·0	8·0	8·2	8·3(9)	.	.	6·2	7·9	8·4	8·5(9)	.	.
„ 9*	5·4	8·2	8·3	8·5(9)	.	.	.	.	.	.	.	.
1890.												
Jan. 3*	4·5	7·2	7·9	.	8·3	.	4·2	7·2	7·4	8·3(9)	.	.
„ 4*	4·0	7·2	7·8	.	8·3	.	.	.	.	.	.	.
„ 21*	.	.	.	.	.	.	5·5	6·1	6·6	7·7(9)	.	.
„ 22*	2·7	6·1	6·1	6·2(9)	.	.	.	.	.	.	.	.
Feb. 12*	2·5	6·4	7·2	.	7·4	.	4·6	7·1	7·3	.	7·4	7·4(11)
„ 13*	3·8	5·9	7·1	.	7·3	.	.	.	.	.	.	.
„ 28*	.	.	.	.	.	.	4·6	6·0	6·8	7·0(8)	.	.
Mar. 1*	3·9	5·4	6·5	6·8(9)	.	.	5·8	5·1	6·8	7·1(8)	.	.
Apr. 1*	.	.	.	.	.	.	12·7	7·3	7·0	6·9(9)	.	.
„ 2*	.	.	.	.	.	.	15·0	7·2	7·0	6·9(9)	.	.
„ 22*	9·4	7·3	7·2	7·2(8)	.	.	7·8	7·2	7·2	7·2(9)	.	.
May 13*	.	.	.	.	.	.	15·0	9·6	8·2	7·4(9)	.	.
„ 14*	13·7	9·1	8·6	.	7·4	.	12·5	9·4	8·5	7·8(8)	.	.
„ 15*	9·8	8·8	8·3	.	8·3	.	11·2	10·0	8·7	8·3(9)	.	.
Sept. 29*	.	.	.	.	.	.	13·0	13·0	13·0	.	12·9	.
„ 30*	7·8	12·7	12·6	.	12·2	.	9·1	12·3	12·4	.	12·4	.
Oct. 1*	.	.	.	.	.	.	6·7	12·1	12·3	.	12·3	.
„ 2*	6·5	11·8	12·3	12·7(9)	.	.	.	.	.	.	.	.
Nov. 11*	6·8	11·2	11·5	.	11·8	11·8(13)	7·4	11·5	11·6	.	11·8	12·1(15)
„ 12*	5·1	10·1	11·8	.	11·7	12·1(13)	3·9	10·1	10·8	.	11·2	11·2(12)
„ 13*	8·3	9·6	10·7	.	10·9	11·2(12)	.	.	.	.	.	.
Dec. 3*	.	.	.	.	.	.	7·1	8·7	10·2	.	10·4	.
„ 4*	3·9	8·1	10·1	.	10·4	.	.	.	.	.	.	.
1891.												
Jan. 14*	.	.	.	.	.	.	3·8	6·7	6·9	7·1(6)	.	.
„ 15*	5·1	6·6	6·8	.	.	.	7·3	6·1	7·2	7·2(6)	.	.
„ 16*	4·6	6·9	7·3	.	.	.	.	.	.	.	.	.
Feb. 10*	.	.	.	.	.	.	6·3	6·1	6·5	6·7(8)	.	.
„ 11*	.	.	.	.	.	.	8·8	6·4	6·6	6·8(8)	.	.
„ 12*	3·3	6·2	6·4	6·4(9)	.	.	.	.	.	.	.	.
Mar. 3*	6·0	6·3	6·2	6·2(6)	.	.	6·5	6·5	6·4	6·5(7)	.	.
„ 4*	9·9	6·2	6·5	6·5(6)	.	.	10·7	6·4	6·4	6·4(7)	.	.

† 10·7 at 20 fathoms.

OFF GREENOCK—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over. 10 fms.
1891.												
Mar. 5*	7·3	6·3	6·5	6·5(7)	.	.	8·1	6·3	6·3	6·3(6)	.	.
,, 6*	5·1	6·3	6·3	6·3(7)	.	.	.	.	.	.	.	.
,, 21*	.	.	.	.	.	.	8·7	6·1	6·1	6·1(6)	.	.
,, 23*	6·3	6·3	6·5	6·5(7)	.	.	.	.	.	.	.	.
,, 24*	4·9	6·1	6·3	6·5(7)	.	.	.	.	.	.	.	.
Apr. 30*	.	.	.	.	.	.	12·3	7·7	6·9	.	6·8	.
May 1*	10·3	7·3	7·1	7·1(9)	.	.	11·9	7·7	7·2	7·3(9)	.	.
Oct. 5*	.	.	.	.	.	.	12·9	12·3	12·3	12·3(7)	.	.
,, 6*	11·3	12·3	12·3	12·2(8)	.	.	12·9	12·3	12·2	12·3(8)	.	.
,, 7*	11·3	12·0	12·2	12·3(7)	.	.	.	.	.	.	.	.
Nov. 9*	.	.	.	.	.	.	8·6	10·3	11·0	11·1(7)	.	.
,, 10*	.	.	.	.	.	.	7·2	10·0	10·8	10·9(7)	.	.
,, 11*	8·3	9·7	10·8	11·1(7)	.	.	.	.	.	.	.	.

7. OBAN BAY.

Date	9 A.M.						3 P.M.					
	Air.	Surf.	0–5 fms.	5–10 fms.	10–15 fms.	Over 15 fms.	Air.	Surf.	0–5 fms.	5–10 fms.	10–15 fms.	Over 15 fms.
1887.												
June 27	.	.	.	.	.	.	14·7	11·2	11·2(2)	11·2(7)	11·0(12)	.
,, 28	12·9	11·2	11·1(5)	10·9(10)	10·8(15)	.	15·0	11·2	11·0(3)	10·7(7)	10·8(13)	10·7(18)
,, 29	15·1	11·2	11·3(2)	11·2(7)	11·0(12)	11·0(17)	17·9	11·3	11·3(5)	11·2(10)	11·2(15)	11·2(20)
,, 30	13·0	11·2	11·2(5)	11·2(10)	.	.	17·9	11·9	11·9(5)	11·7	.	.
July 1	14·7	11·5	11·5(1)	11·4(6)	11·3(11)	.	15·7	11·8	11·8(5)	11·4(10)	.	.
,, 2	15·0	11·4	11·3(5)	11·2(10)	11·3(15)	11·2(20)	14·1	11·5	11·4(2)	11·3(7)	11·2(12)	.
,, 3	15·8	11·8	11·3(5)	11·3(10)	.	.	15·1	11·3	11·2(2)	11·1(6)	11·2(11)	.
,, 4	13·3	11·3	11·3(4)	11·2(9)	11·2(14)	11·2(19)	13·4	11·4	11·4(5)	11·2(10)	11·2(15)	11·2(20)
,, 5	14·6	11·8	11·4(3)	11·2(8)	11·3(13)	11·2(18)	16·8	11·9	11·4(5)	11·3(10)	11·3(15)	11·2(20)
,, 6	13·9	11·7	11·7(5)	11·3(10)	11·3(15)	11·2(20)	15·2	11·8	11·4(5)	11·3(10)	11·3(15)	11·2(20)
,, 7	12·3	11·4	11·3(5)	11·2(10)	11·3(15)	11·2(20)	17·4	12·1	11·9(5)	11·3(10)	11·2(15)	.
,, 8	17·9	11·4	11·4(5)	11·3(10)	.	.	22·2	12·3	11·9(3)	11·5(8)	.	.
,, 9	15·7	11·8	11·6(5)	11·6(10)	.	.	17·3	11·8	11·4(3)	11·3(8)	.	.
,, 10	13·4	11·4	11·3(5)	11·2(10)	.	.	14·6	11·9	11·9(4)	11·8(9)	.	.
,, 11	14·5	11·5	11·5(8)	11·3(10)	.	.	14·7	11·8	11·5(4)	11·2(9)	.	.
,, 12	16·3	12·0	12·0(5)	11·8(10)	.	.	18·3	12·3	12·3(2) 12·3(4)	12·3(7)	.	.
Aug. 15	12·8	13·8	13·7(5)	12·9(10)	.	12·3(20) 12·3(22)	.	.	.	.	.	.
1889.												
June 5	18·0	9·8	9·6(5)	9·6(10)	9·5(15)	9·5(16)	17·4	11·9	9·6(5)	9·6(10)	.	.
,, 6	19·3	10·4	9·7(5)	9·6(10)	9·6(15)	9·6(17)	16·8	11·9	9·7(5)	9·6(10)	.	.
,, 7	14·6	10·8	11·7(5)	9·9(10)	9·6(15)	.	.	.	.	.	.	.
,, 8	.	.	.	.	.	.	13·8	12·1	10·7(5)	9·6(10)	9·6(11)	.
,, 21	15·6	12·1	10·7(5)	10·6(10)	10·6(11)	.	20·5	13·7	10·8(5)	10·6(10)	10·6(11)	.
,, 22	13·3	13·0	10·8(5)	10·8(10)	.	.	16·7	13·4	10·8(5)	10·8(10)	.	.
,, 23	11·2	13·3	10·8(5)	10·8(10)	.	.	17·6	12·3	10·8(5)	10·8(10)	10·8(11)	.
,, 24	16·7	11·7	10·8(5)	10·8(10)	10·7(15)	10·7(16)	19·3	12·6	11·5(5)	10·8(10)	10·8(12)	.
,, 25	13·9	11·5	10·9(5)	10·8(10)	10·8(13)	.	18·2	13·0	11·3(5)	10·8(10)	.	.
,, 26	11·1	11·9	11·0(5)	10·9(10)	10·8(15)	10·8(16)	16·1	13·2	11·5(5)	11·3(10)	.	.
,, 27	14·1	12·2	10·8(5)	10·8(10)	.	.	.	.	.	.	.	.
,, 28	15·4	13·0	11·5(5)	11·3(10)	.	.	.	.	.	.	.	.

8. CASTLE BAY, BARRA.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	Over 10 fms.	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	Over 10 fms.
1887.												
June 12	11·9	10·2	10·2(2)	.	10·2(7)	.	12·2	11·2	.	.	10·2(6)	.
,, 13	11·8	10·1	10·2(2)	.	10·1(7)	.	10·6	10·2	.	.	10·1(6)	.
,, 14	14·5	10·8	10·8(2)	.	10·7(7)	.	.	.	.	.	.	.
,, 17	.	.	.	.	.	.	19·6	10·1	9·3(1)	.	9·1(6)	.
,, 18	19·6	11·9	10·8(2)	.	10·7(7)	.	16·3	11·3	10·9(3)	.	10·8(8)	.
,, 19	16·2	11·2	11·0(2)	.	10·7(7)	.	16·3	11·2	11·0(2)	.	10·7(7)	.
,, 20	12·8	9·6	9·4(2)	.	9·4(7)	.	.	.	.	.	.	.
,, 21	15·0	11·8	11·8(2)	.	11·6(7)	.	16·2	11·8	10·8(2)	.	10·8(7)	.
,, 22	16·9	12·3	12·2(2)	.	12·1(7)	.	.	.	.	.	.	.
,, 23	.	.	.	.	.	.	15·7	10·4	10·4(2)	.	10·4(7)	.
,, 24	18·4	12·4	12·4(3)	.	12·3(7)	.	16·2	12·6	12·5(2)	.	12·4(7)	.
,, 25	14·7	11·8	12·5(2)	.	12·2(7)	.	.	.	.	.	.	.
,, 26	15·7	11·9	11·5(2)	.	11·5(7)	.	.	.	.	.	.	.
1888.												
June 23	19·0	11·9	11·8(4½)	.	.	.	17·6	11·9	11·9(4½)	.	.	.
,, 24	17·2	11·9	11·9(4)	.	.	.	20·6	12·1	12·1(4)	.	.	.
,, 25	17·2	11·9	.	11·8	.	.	21·0	12·3	12·0(4)	.	.	.
,, 26	17·7	12·4	11·9(4¾)	.	.	.	18·0	13·0	12·1(4)	.	.	.
,, 27	17·8	.	.	.	.	.	15·6	12·7	.	12·0	.	.
,, 28	17·2	12·1	.	11·9	.	.	11·7	12·2	12·2(3¾)	.	.	.
,, 29	11·1	12·3	.	11·8	.	.	.	.	.	.	.	.
,, 30	10·6	11·3	.	11·3	.	.	15·0	12·2	11·3(4½)	.	.	.
July 13	.	.	.	.	.	.						
1889.												
May 24	9·6	9·4	.	9·5	.	.	9·5	9·5	.	9·4	9·5(6)	.
,, 25	12·2	9·6	.	9·5	.	.	12·3	9·7	.	9·5	9·5(6)	.
,, 26	12·3	9·9	9·7(4)	.	.	.	16·3	10·1	10·0(4)	.	.	.
,, 27	16·8	10·2	10·1(4)	.	.	.	.	.	.	.	.	.
,, 28	13·7	10·0	10·0(4)	.	.	.	.	.	.	.	.	.
,, 29	.	.	.	.	.	.	15·6	10·2	.	10·1	.	.
,, 30	13·4	10·1	.	9·9	9·9(6)	.	.	.	.	.	.	.
1891.												
May 21	8·7	9·2	.	9·1	.	.	8·5	9·3	.	9·2	.	.
,, 22	11·9	9·3	.	9·3	.	.	10·0	9·3	.	9·3	.	.
,, 23	8·8	9·1	.	9·3	.	.	12·8	9·3	.	9·3	.	.
,, 24	11·7	9·2	.	.	9·3(5½)	.	11·7	9·3	.	9·3	.	.
,, 25	8·8	9·3	.	9·3	.	.	10·0	9·3	.	9·3	.	.
,, 26	9·7	9·3	.	.	9·3(5½)	.	.	.	.	.	.	.
June 9	10·5	11·0	.	10·7	.	.	10·8	10·8	10·7(4)	.	.	.
,, 10	10·1	10·7	.	10·7	.	.	13·8	10·7	10·7(4)	.	.	.
,, 11	14·4	10·8	.	10·8	.	.	12·2	11·2	11·2(4)	.	.	.
,, 12	10·0	11·3	.	12·4	.	.	10·0	11·3	12·6(4)	.	.	.
,, 22	15·2	11·2	10·9(4½)	.	.	.	17·1	11·2	12·2(4)	.	.	.
,, 23	19·8	11·3	.	11·1	.	.	20·0	11·9	11·5(4)	.	.	.
,, 24	18·3	12·4	.	11·8	.	.	21·2	12·4	11·8(4)	.	.	.

9. VATERSAY BAY.

Date.	9 A.M.						3 P.M.						
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1887.													
May 1*	13·2	10·6	10·4	.	10·0	.	14·4	13·2	.	10·1	.	10·0	.
June 20	.	.	.	.	.	.	16·1	12·9	.	11·5	.	10·2	.
,, 25	.	.	.	.	.	.	15·8	12·5	12·5(2)	.	12·5(7)	.	.
1888.													
May 24*	14·0	14·0	9·4	8·7(7)	.	.	.	.	.	.	.	.	.
June 1*	8·7	9·2	9·1	9·1(7)	.	.	8·9	9·6	.	9·4	9·3(7)	.	.
,, 6*	10·0	9·4	9·4	.	9·3	.	8·9	9·4	.	9·4	.	9·4	9 3(12)
,, 7*	.	9·5	9·4	.	9·3	9·3(11)	.	.	.	.	.	.	.
,, 26	.	.	.	.	.	.	22·7	17·1	.	11·8	.	.	.
,, 30	.	.	.	.	.	.	13·3	11·9	11·9(4)	.	.	.	.
1890.													
May 27*	16·1	12·1	11·8	10·8(9)	.	.	18·3	12·2	.	11·8	10·8(9)	.	.

10. STORNOWAY LOCH.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.
1887.												
June 4*	16·2	11·4	10·4(4)	.	9·9(8)	.	16·1	12·4	10·4(4)	.	10·0(8)	.
,, 5*	13·4	11·8	10·3(4)	.	9·6(8)	.	17·0	12·6	11·3(4)	.	10·4(8)	.
,, 6*	13·3	12·3	9·9(4)	.	9·6(8)	.	15·9	12·7	11·5(4)	.	10 5(8)	.
,, 10*	.	.	.	.	.	.	15·5	9·4	8·5(4)	.	8·3(7)	.
,, 11*	12·9	9·3	9·0(4)	.	8·8(7)	.	13·2	9·4	9·0(4)	.	8·7(7)	.
,, 12*	13·0	9·5	9·4(4)	.	8·8(7)	.	13·8	9·6	9·7(4)	.	9·6(7)	.
,, 13*	12·7	9·8	8·7(4)	.	8·7(7)	.	10·5	9·1	8·9(4)	.	8·5(7)	.
,, 17*	13·4	11·0	10·4(3)	.	10·1(6)	.	16·1	12·0	10·0(3)	.	10·0(6)	.
,, 18*	12·4	10·8	10·1(3)	.	9·9(6)	.	.	.	.	.	.	.
,, 21*	.	.	.	.	.	.	20·0	13·2	11·3(3)	.	11·0(6)	.
,, 22*	16·6	14·0	11·8(3)	.	11·2(6)	.	18·6	14·0	12·7(3)	.	11·2(6)	.
,, 23*	15·4	14·0	12·0(3)	.	11·0(6)	.	18·2	14·6	12·0(3)	.	11·7(6)	.
,, 24*	13·3	14·1	12·9(3)	.	11·1(6)	.	15·9	14·5	12·6(3)	.	11·6(6)	.
,, 25*	.	14·3	13·3(3)	.	11·7(6)	.	16·1	15·5	13·2(3)	.	10·9(6)	.
Nov 27	.	.	.	.	.	.	5·5	9·0	.	8·5	8·5(6)	.
,, 28	3·8	9·1	.	8·5	8·5(6)	.	4·7	9·1	.	8·5	8·5(6)	.
,, 29	3·3	7·2	.	8·0	8·0(6)	.	3·5	8·9	.	9·1	9·0(6)	.
,, 30	6·5	8·5	.	9·0	8·5(7)	.	7·2	8·6	.	.	9·0(5¾)	.
Dec. 4	.	.	.	.	.	.	5·8	8·5	.	.	10·7(5¼)	.
,, 5	5·5	8·3	.	.	.	.	5·0	8·5	.	.	10·7(5½)	.
,, 6	5·0	8·0	.	8·7	9·5(7)	.	3·8	7·4	.	9·1	9·1(6¾)	.
,, 7	1·8	9·1	.	9·1	9·1(6¾)	.	2·4	9·0	.	9·1	9·1(6½)	.
,, 8	0·7	8·2	.	8·8	9·0(6)	.	3·8	8·2	.	8·8	9·1(6½)	.
,, 9	2·8	9·1	.	9·1	9·1(6)	.	.	.	.	.	.	.
,, 14	.	.	.	.	.	.	6·9	3·4	.	7·3	.	.
,, 15	2·2	6·8	.	7·9	7·8(7)	.	4·6	7·1	.	8·0	.	.
,, 16	5·0	5·7	.	7·9	7·9(6)	.	6·0	5·7	.	7·9	.	.
,, 17	4·4	5·9	.	5·7	7·2(8)	.	4·1	7·7	.	8·0	.	.
,, 18	0·3	7·8	.	.	.	.	1·9	7·9	.	8·0	.	.
,, 19	5·0	7·7	.	7·9	7·9(7)	.	.	.	.	.	.	.
,, 21	.	.	.	.	.	.	7·0	7·3	.	7·9	.	.
,, 22	5·0	7·2	.	7·3	.	.	7·0	7·4	.	7·6	7·6(6½)	.
,, 23	3·2	7·4	.	7·6	7·9(6)	.	7·3	7·9	.	7·9	8·0(7)	.
1888.												
Jan. 21	9·5	7·4	.	8·0	.	.	10·8	7·6	.	7·5	7·5(7)	.
,, 22	8·0	7·8	.	.	.	.	9·9	7·7	.	.	.	.
,, 23	9·0	7·8	.	.	7·4(5½)	.	10·0	7·9	.	7·6	7·6(7)	.
,, 24	6·2	7·4	.	7·5	.	.	8·3	8·0	.	7·5	.	.
Apr. 5	9·1	6·0	.	6·2	.	.	7·8	6·3	.	6·2	.	.
,, 6	6·1	6·7	.	6·2	.	.	8·3	6·9	.	6·3	6·3(6)	.
,, 7	8·9	6·3	.	6·3	.	.	7·8	6·3	.	.	6·3(5½)	.
,, 8	6·7	6·8	6·9(4¾)	.	.	.	10·4	6·1	6·3(4)	.	.	.
,, 9	8·3	6·9	.	6·4	.	.	8·9	6·8	.	6·8	.	.
,, 10	8·2	6·4	.	6·7	6·7(7)	.	9·6	6·9	.	6·3	6·3(7)	.
,, 11	5·4	6·5	.	6·3	.	.	6·2	6·5	.	6·5	.	.
,, 12	6·7	6·4	.	.	6·5(5¾)	.	.	.	.	.	.	.
May 18*	11·0	8·3	.	7·5	7·3(9)	.	.	.	.	.	.	.
,, 19*	10·8	9·0	.	7·6	7·5(9)	.	13·4	10·1	.	7·8	7·4(9)	.
,, 20*	8·9	10·0	.	7·6	7·6(9)	.	12·9	10·1	.	8·0	.	7·8
,, 21*	11·1	9·3	.	8·3	7·7(8)	.	.	.	.	.	.	.
,, 22*	15·0	8·2	.	7·7	7·7(8)	.	.	.	.	.	.	.
,, 26*	8·3	9·4	.	9·0	8·9(9)	.	8·3	9·4	.	9·4	8·8(8)	.
,, 27*	.	.	.	.	.	.	7·2	9·3	.	9·2	8·7(8)	.
,, 28*	7·2	9·1	.	9·0	8·8(9)	.	9·3	9·5	.	9·3	8·8(7)	.
June 3*	4·1	7·7	.	.	8·0(6)	.	.	.	.	.	.	.
,, 4*	8·7	7·7	.	.	7·7(6)	.	10·1	8·3	.	7·7	7·6(7)	.
,, 5*	8·4	8·3	.	7·9	7·9(6)	.	.	.	.	.	.	.
,, 9*	11·1	9·8	.	8·7	.	8·3	10·3	9·7	.	8·8	.	8·5
,, 10*	9·8	9·2	.	8·9	.	8·5	11·7	9·1	.	9·0	8·9(9)	.
,, 11*	10·9	8·6	.	8·3	.	8·0	.	.	.	.	.	.
,, 15*	.	.	.	.	.	.	15·0	12·7	.	8·7	8·2(9)	.
,, 16*	14·9	11·9	.	9·2	.	8·5	15·0	12·6	.	9·4	8·5(9)	.
,, 17*	14·5	10·5	.	8·7	8·4(8)	.	.	.	.	.	.	.
,, 18*	11·6	9·8	.	8·7	8·3(8)	.	11·9	10·0	.	9·6	8·5(9)	.
,, 19*	11·3	10·1	.	8·9	8·5(7)	.	.	.	.	.	.	.
,, 22*	.	.	.	.	.	.	12·8	12·2	.	11·2	9·6(8)	.
,, 23*	13·5	11·6	.	11·2	9·9(8)	.	14·7	13·4	.	11·2	10·4(8)	.
,, 24*	13·6	12·3	.	11·2	8·6(8)	.	17·0	13·4	.	11 2	10·5(8)	.
,, 25*	16·1	12·9	.	11·1	9·6(9)	.	21·7	14·4	.	14·3	11·1(7)	.
,, 26*	16·8	13·4	.	11·0	10·5(9)	.	23·7	16·2	.	10·9	10·4(7)	.
July 4	10·1	12·1	.	12·1	.	.	11·5	12·2	.	12·2	12·2(6)	.
,, 5	11·0	12·0	.	11·9	.	.	10·5	11·8	.	11·9	11·9	.
,, 6	10·0	12·0	.	11·4	.	.	11·9	11·9	.	.	11·4(5¾)	.
,, 7	11·0	11·8	.	11·3	11·3(6	.	12·2	11·2	.	11·3	.	.
,, 17	13·8	12·8	.	.	11·8(5½)	.	.	.	.	.	.	.
Sept. 24*	9·4	12·2	.	12·2	12·3(7)	.	9·4	12·3	.	12·3	.	.
1889.												
May 13*	10·0	9·4	.	10·0	9·3(7)	.	10·0	10·3	.	9·9	9·2(8)	.

10. Stornoway Loch—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.
May 14*	9·7	9·9	.	9·0	8·8(7)	.	9·4	10·0	.	9·5	9·4(7)	.
,, 15*	8·9	9·6	.	9·3	9·0(8)	.	.	.	.	.	.	.
,, 18*	.	.	.	.	.	.	15·9	11·0	.	9·3	9·0(6)	.
,, 20*	.	.	.	.	.	.	10·9	11·5	.	9·0	9·0(7)	.
,, 22*	14·9	10·4	.	9·7	9·3	.	13·3	11·0	.	9·2	9·2(8)	.
,, 25*	10·7	10·7	.	9·0	8·9(7)	.	.	.	.	.	.	.
,, 27*	12·0	10·8	.	9·6	9·0(8)	.	13·5	11·2	.	9·6	9·0(7)	.
,, 30*	11·6	11·6	.	9·9	9·1(9)	.	.	.	.	.	.	.
June 11*	11·0	10·4	.	9·9	9·9(8)	.	12·7	10·6	.	10·4	10·2(8)	.
,, 15*	13·0	11·1	.	10·0	10·3(9)	.	.	.	.	.	.	.
,, 17*	13·5	10·5	.	10·3	10·0(9)	.	13·8	10·4	.	10·1	10·0(8)	.
,, 18*	12·8	11·1	.	10·1	9·9(9)	.	.	.	.	.	.	.
,, 19*	.	.	.	.	.	.	16·9	12·7	.	10·5	10·1(6)	.
,, 20*	15·3	12·3	.	10·7	10·4(6)	.	.	.	.	.	.	.
,, 22*	11·6	12·9	.	11·8	10·7(7)	.	.	.	.	.	.	.
,, 24*	14·5	13·8	.	12·3	10·3(7)	.	17·2	14·6	.	12·9	.	10·4
,, 26*	13·9	14·7	.	13·1	10·1(8)	.	.	.	.	.	.	.
1890.												
Apr. 7	.	.	.	.	.	.	10·0	7·0	7·0(4½)	.	.	.
,, 8	7·2	7·0	.	7·0	7·0(7)	.	6·7	7·0	7·0(4)	.	.	.
,, 9	5·7	7·2	.	7·0	7·0(7)	.	7·2	7·4	7·2(4)	.	.	.
,, 10	4·2	7·5	.	7·2	.	.	6·5	7·2	7·2(4)	.	.	.
,, 11	6·7	7·0	.	.	7·2(5½)	.	11·1	7·1	.	7·1	7·0(7)	.
,, 12	8·7	7·0	7·0(4)	.	.	.	.	.	.	.	.	.
,, 13	8·0	7·4	7·4(4)	.	.	.	.	.	.	.	.	.
,, 15	9·0	7·6	.	7·8	.	.	.	.	.	.	.	.
May 23*	.	.	.	.	.	.	23·3	12·4	.	9·6	8·5(8)	.
,, 31*	9·0	10·1	.	10·0	9·8(7)	.	13·4	10·2	.	9·9	9·6(8)	.
June 2*	.	.	.	.	.	.	10·8	10·0	.	9·8	9·8(9)	.
,, 3*	13·5	10·0	.	9·9	9·9(8)	.	.	.	.	.	.	.
,, 9*	14·7	10·2	.	10·0	9·1(8)	.	14·4	10·7	.	9·9	9·1(7)	.
,, 11*	.	.	.	.	.	.	17·2	12·0	.	11·1	10·0(9)	.
,, 12*	11·6	11·3	.	11·0	9·4(9)	.	.	.	.	.	.	.
,, 13*	.	.	.	.	.	.	12·2	12·1	.	11·1	9·8(9)	.
,, 14*	11·0	11·0	.	10·8	10·0(7)	.	.	.	.	.	.	.
,, 18*	11·6	10·5	.	10·0	9·8(7)	.	.	.	.	.	.	.
,, 21*	14·1	10·1	.	9·9	9·6(8)	.	.	.	.	.	.	.
,, 23*	14·8	10·9	.	10·1	10·0(8)	.	.	.	.	.	.	.
,, 25*	.	.	.	.	.	.	13·4	10·8	.	10·4	10·1(7)	.
,, 28*	12·2	11·4	.	10·5	10·0(8)	.	.	.	.	.	.	.
,, 30*	13·9	11·5	.	11·3	10·1(8)	.	.	.	.	.	.	.
1891.												
May 21	7·7	7·9	.	7·8	7·8(9)	.	9·9	7·9	.	7·7	7·6(8)	.
,, 22	.	.	.	.	.	.	9·7	8·3	.	7·9	.	7·7
,, 23	10·5	8·4	.	8·3	.	8·1	.	.	.	.	.	.
,, 25	9·1	9·0	.	8·8	.	8·3	.	.	.	.	.	.
,, 29	.	.	.	.	.	.	12·3	9·7	.	8·7	8·7(6)	.
,, 30	12·2	9·7	.	9·0	.	.	17·8	10·1	.	9·1	.	.
,, 31	11·9	10·2	.	9·1	9·1(6)	.	14·5	10·1	.	9·1	.	.
June 1	.	.	.	.	.	.	17·9	12·6	.	9·0	8·8(9)	.
,, 5	.	.	.	.	.	.	12·2	11·2	.	10·4	9·6(9)	.
,, 6	12·2	11·1	.	9·2	.	9·2	11·2	11·2	.	9·8	9·5(9)	.
,, 7	11·6	10·6	.	9·7	9·7(6)	.	11·1	10·7	.	9·7	9·7(6)	.
,, 8	11·5	10·7	.	9·7	9·7(6)	.	.	.	.	.	.	.
,, 13	11·2	9·7	.	9·7	9·5(9)	.	12·6	9·9	.	10·0	9·9(9)	.
,, 15	10·4	9·3	.	8·4	8·3(9)	.	11·3	9·7	.	9·5	.	9·4
,, 20	13·4	11·6	.	11·5	11·1(9)	.	15·0	12·7	.	10·8	9·5(9)	.
,, 22	17·2	12·8	.	9·4	9·4(9)	.	23·3	12·0	.	9·6	9·5(9)	.
,, 23	19·0	12·8	.	10·2	9·6(9)	.	.	.	.	.	.	.
,, 25	.	.	.	.	.	.	19·0	12·6	11·4(4)	.	.	.
,, 26	17·4	12·9	.	11·5	.	.	20·6	13·0	.	11·9	.	.
,, 27	13·3	13·3	.	12·1	.	.	13·8	13·0	.	12·0	.	.
,, 27	13·4	13·4	.	12·1	.	9·6	.	.	.	.	.	.
,, 28	10·7	13·2	.	12·0	.	.	13·9	13·0	.	13·0	.	.
,, 29	16·5	13·5	.	13·3	13·3(7)	.	14·7	14·3	.	12·0	9.8(9)	.
,, 29	13·4	13·2	.	11·8	10·0(9)	.	14·5	13·2	.	12·2	10·0(	.
,, 30	13·3	13·3	.	11·9	10·0(9)	.	.	.	.	.	.	.
July 3	.	.	.	.	.	.	12·8	12·7	.	11·2	10·7(7)	.
,, 4	13·3	11·8	.	11·1	10·7(7)	.	.	.	.	.	.	.
,, 6	12·7	11·9	.	11·5	10·7(7)	.	.	.	.	.	.	.
,, 10	13·3	11·3	.	11·1	11·0(7)	.	14·3	11·5	.	11·1	10·8(6)	.

11. KIRKWALL BAY, ORKNEY.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	Over 10 fms.	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	Over 10 fms.
1889.												
Sept. 25	9·5	10·1	.	10·4	.	.	8·5	10·3	.	10·5†	.	.
,, 26	8·9	10·5	.	10·5	10·5(7)	.	9·4	10·1	.	10·4	.	.
,, 27	12·2	10·6	.	10·5	10·5(7)	.	9·0	10·5	.	10·5	10·5(7)	.
,, 28	10·0	10·4	.	10·5	10·5(7)	.	11·6	10·6	.	10·6	10·5(7)	.
,, 29	9·3	10·2	.	10·3	.	.	9·6	10·2	.	10·4	10·4	.
,, 30	9·4	10·2	.	10·3	.	.	8·4	10·1	.	10·3	10·3(6)	.
1890.												
Feb. 14	.	.	.	.	.	.	6·1	5·7	.	5·5	5·5(6)	.
,, 15	3·9	5·6	.	5·5	5·5(7)	.	6·0	5·7	.	5·5	5·5(7)	.
,, 16	4·0	5·6	.	5·5	5·5(6)	.	4·6	5·7	.	5·6	5·6(7)	.
,, 17	7·4	5·5	.	5·5	5·5(7)	.	.	.	.	.	.	.
,, 19	.	.	.	.	.	.	4·6	5·8	.	5·9	5·9(6)	.
,, 20	4·4	5·8	.	5·8	5·8(6)	.	4·0	5·8	.	5·8	5·8(6)	.
,, 21	4·4	6·0	.	6·0	6·0(6)	.	5·6	5·8	.	5·9	5·9(7)	.
Aug. 28	12·2	12·0	.	12·6	12·6(7)	.	.	.	.	.	.	.
Sept. 30	.	.	.	.	.	.	13·3	11·2	.	11·2	11·2(6)	.
Oct. 1	8·3	11·1	.	11·3	.	.	9·9	11·3	.	11·3	11·3(6)	.
,, 2	7·3	11·2	.	11·3	.	.	8·3	11·2	.	11·3	11·3(6)	.
,, 3	13·9	11·1	.	11·3	.	.	12·9	11·7	.	11·7	11·7(7)	.
,, 4	11·8	11·6	.	11·4	.	.	.	.	.	.	.	.
1891.												
Jan. 22	.	.	.	.	.	.	2·8	5·1	.	5·5	5·5(6)	.
,, 23	1·7	5·2	.	5·5	5·5(7)	.	5·8	5·3	.	5·5	5·5(7)	.
,, 24	4·5	5·4	.	5·4	5·4(6)	.	3·3	5·8	.	5·7	5·7(7)	.
,, 25	5·0	5·7	.	5·8	5·7(6)	.	6·3	5·7	.	5·7	5·8(7)	.
,, 26	.	.	.	.	.	.	6·9	5·8	.	5·7	5·8(7)	.
Apr. 12	7·9	6·2	.	6·2	6·2(7)	.	8·3	6·2	.	6·2	6·2(7)	.
,, 13	5·0	6·2	.	6·2	6·2(7)	.	7·9	6·3	.	6·3	6·3(7)	.
,, 14	6·8	6·4	.	6·3	6·3(7)	.	10·0	6·2	.	6·3	6·3(7)	.
,, 15	.	.	.	.	.	.	7·8	6·4	.	6·4	6·4(7)	.
,, 16	5·8	6·4	.	6·4	6·4(6)	.	7·2	6·4	.	6·5	6·5(7)	.
,, 17	8·5	6·6	.	6·6	.	.	7·2	6·5	.	6·5	6·5(6)	.
July 5	12·8	11·8	.	10·9	.	.	17·6	12·3	.	11·1	.	.
,, 6	12·8	11·1	.	11·1	.	.	12·2	11·1	.	11·2	.	.
Sept. 11	13·8	12·3	.	12·3	12·3(6)	.	15·4	12·4	.	12·3	12·7(7)	.
,, 12	15·7	12·4	.	12·2	12·2(6)	.	15·5	12·4	.	12·2	12·2(7)	.
,, 13	12·6	12·3	.	12·2	12·2(6)	.	15·0	12·4	.	12·4	12·3(7)	.
,, 14	11·9	12·4	.	12·4	12·4(7)	.	12·2	12·3	.	12·4	12·4(6)	.
1892.												
Sept. 15	12·0	12·3	.	12·2	12·3(7)	.	12·2	12·3	.	12·3	12·3(6)	.
Nov. 27	.	.	.	.	.	.	6·7	8·4	.	8·3	8·3(6)	.
,, 28	4·8	8·1	.	8·4	8·4(6)	.	7·3	8·1	.	8·1	8·1(6)	.
,, 29	8·3	7·9	.	8·0	7·9(7)	.	6·7	8·2	.	8·2	8·2(6)	.
,, 30	6·7	8·0	.	7·7	7·7	.	7·6	7·9	.	8·0	8·0(6)	.
Dec. 1	7·2	7·9	.	8·5	8·1(6)	.	9·1	8·1	.	8·1	8·1(7)	.
,, 2	9·1	8·1	.	8·1	8·1(7)	.	7·2	8·0	.	8·2	8·2(6)	.

† 4½ fathoms.

12. WICK BAY.

Date.	9 A.M						3 P.M.					
	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.
1887.												
Aug. 20	12·2	12·3	.	12·3	.	.	13·3	12·5	.	12·3	.	.
,, 21	9·5	12·2	.	12·2	.	.	12·8	12·2	.	12·2	.	.
,, 22	13·0	12·0	12·1(4)	.	.	.	13·3	12·1	12·1(4)	.	.	.
,, 23	15·6	12·3	12·3(4)	.	.	.	13·3	12·3	12·3(4)	.	.	.
,, 24	15·0	12·2	12·2(4)	.	.	.	13·5	12·3	12·3(4)	.	.	.
,, 25	12·4	12·3	12·3(4)	.	.	.	.	.	.	.	.	.
,, 31	.	.	.	.	.	.	13·8	13·0	.	12·5	.	.
Sept. 1	15·5	12·9	.	13·3	.	.	.	.	.	.	.	.
1888.												
Jan. 25	.	.	.	.	.	.	7·5	8·4	.	8·0	.	.
Mar 28	3·0	5·0	.	5·1	5·2(7)	.	.	.	.	.	.	.
July 31	11·8	10·2	.	10·2	10·2(6)	.	13·3	10·8	.	10·2	10·2(6)	

12. WICK BAY—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Air.	0–5 fms.	5 fms.	5–10 fms.	10 fms.	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	10 fms.
1888.												
Aug. 1	14·0	10·7	.	10·2	10·2(6)	.	.	.	.	.	.	.
,, 2	15·5	10·3	.	10·2	.	.	15·0	10·4	.	10·7	.	.
,, 3	13·8	10·6	.	10·2	.	.	.	.	.	.	.	.
,, 6	.	.	.	.	.	.	14·4	10·8	.	.	10·8(5¼)	.
,, 7	15·1	11·0	.	.	10·9(5½)	.	16·2	10·8	.	.	10·4(5½)	.
,, 8	15·0	10·8	.	10·2	.	.	.	.	.	.	.	.
,, 9	16·1	10·9	.	10·8	.	.	.	.	.	.	.	.
,, 10	15·4	10·8	.	10·4	10·4(6)	.	14·3	10·8	.	10·6	.	.
,, 14	.	.	.	.	.	.	12·1	10·7	.	10·5	10·5(6½)	.
,, 15	11·4	10·5	10·5(4½)	.	.	.	12·1	10·6	.	10·5	10·5(6)	.

13. INVERGORDON, CROMARTY FIRTH.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	0–5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	0–5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1887.												
Aug. 26	15·0	13·5	13·5(2)	13·4(7)	.	13·0(12)	21·8	13·9	13·2(2)	13·2(7)	.	13·0
,, 27	15·8	14·0	13·5(2)	13·0(7)	.	13·0(12)	21·1	13·8	.	.	.	.
,, 28	15·5	14·5	.	.	.	.	18·8	14·6	.	.	.	.
,, 29	15·5	14·1	13·5(3)	12·9(8)	.	12·7(13)	.	.	.	.	.	.
,, 30	16·8	13·9	.	.	.	.	.	.	.	.	.	.
Sept. 2	19·6	14·0	13·7(1)	13·7(6)	.	13·5(11)	13·5	13·8	13·6(1)	13·7(6)	.	13·5(11)
,, 3	15·1	13·5	13·5(2)	13·5(7)	.	13·5(12)	15·1	14·1	14·0(2)	13·5(7)	.	13·5(12)
,, 4	16·4	13·7	.	.	.	.	12·8	13·5	.	.	.	.
,, 5	12·7	13·3	13·3(1)	13·0(6)	.	13·0(11)	14·5	13·3	13·3(2)	13·0(7)	.	13·2(12)
,, 6	11·1	13·3	.	.	.	.	11·1	13·1	13·1(1)	13·0(7)	.	13·0(12)
,, 7	9·4	13·0	13·0(1)	13·0(6)	.	13·0(11)	.	.	.	.	.	.
,, 8	15·0	12·6	12·4(3)	12·4(8)	.	.	13·9	12·5	12·4(5)	.	12·4	.
,, 9	15·0	13·0	13·0(5)	.	12·9	.	13·0	12·9	12·9(1)	11·9(6)	.	11·9(11
,, 10	13·4	13·0	11·9(5)	.	11·8	.	12·6	12·1	.	.	.	.
,, 11	10·2	11·9	.	.	.	.	11·2	11·9	.	.	.	

13. INVERGORDON, CROMARTY FIRTH—*continued.*

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air	Surf.	5 fms.	5-10 fms.	10 fms.	Over 10 fms.
1887.												
Nov. 5	.	.	.	.	.	.	10·0	7·7	.	.	.	.
,, 6	7·8	7·5	.	.	.	.	9·5	7·8	.	.	.	.
,, 7	7·8	7·8	.	.	.	.	7·3	8·0	.	.	.	.
,, 8	7·8	7·7	.	.	.	.	8·3	7·7	.	.	.	.
,, 9	6·1	7·2	.	.	.	.	7·3	7·9	.	.	.	.
,, 10	5·4	7·0	.	.	.	.	6·3	7·9	.	.	.	.
,, 11	6·4	7·7	.	.	.	.	6·9	7·2	.	.	.	.
,, 12	5·0	7·2	.	.	.	.	5·7	7·2	.	.	.	.
,, 13	3·5	7·2	.	.	.	.	4·0	7·2	.	.	.	.
,, 14	2·3	6·6	.	.	.	.	2·4	6·7	.	.	.	.
,, 15	0·7	6·5	.	.	.	.	2·4	6·6	.	.	.	.
,, 16	7·9	8·0	.	.	.	.	.	.	.	.	.	.
1888.												
Jan. 26	4·0	5·2	5·4(5)	.	5·8	5·9(13)	2·3	5·3	5·4(5)	.	5·8	5·8(12)
,, 27	1·3	5·0	.	.	.	.	1·0	5·0	.	.	.	.
Mar. 29	2·7	3·5	3·5(5)	.	3·5	3·5(12)	3·8	3·5	3·5(5)	.	3·5	3·5(16)
,, 30	4·1	3·5	3·5(5)	.	3·5	3·5(12¾)	.	.	.	.	.	.
1889.												
July 10	14·3	14·0	13·5	.	13·5	.	13·1	14·0	14·1	.	14·0	.
,, 11	11·6	14·1	14·1	.	13·9	13·9(12)	12·6	14·2	13·9	.	13·8	.
Aug. 1	18·2	15·8	16·1	.	16·0	16·0(11)	21·0	16·6	15·8	.	15·7	15·7(13)
,, 2	17·8	16·3	16·1	.	16·1	16·1(12)	.	.	.	.	.	.
,, 3	15·5	16·3	16·1	.	16·1	16·1(11)	.	.	.	.	.	.
,, 27	13·4	12·2	13·0	.	13·3	.	.	.	.	.	.	.
,, 28	16·3	13·3	13·3	.	13·3	13·3(12)	.	.	.	.	.	.
,, 29	13·9	12·6	13·5	.	13·4	.	.	.	.	.	.	.
,, 30	13·9	13·6	13·5	.	13·5	13·5(11)	.	.	.	.	.	.
,, 31	13·8	13·5	13·4	.	13·5	.	.	.	.	.	.	.
Sept. 2	11·2	13·6	13·6	.	13·5	13·5(11)	17·8	13·9	13·4	.	13·4	13·4(11½)
,, 22	7·6	13·8	12·0	.	12·0	.	.	.	.	.	.	.
,, 23	9·4	10·7	10·4	.	11·1	11·1(12½)	.	.	.	.	.	.
Nov 21	9·4	8·9	9·0	.	9·3	9·2(14)	10·6	8·8	8·9	.	8·9	8·9(12)
1890.												
Feb. 23	.	.	.	.	.	.	10·0	4·6	4·9	.	5·0	5·0(13)
,, 24	5·7	4·5	4·6	.	5·0	.	7·7	4·7	4·7	.	5·0	5·0(12)
,, 25	4·0	4·5	5·0	.	5·0	.	6·3	5·0	5·2	.	5·2	5·2(11)
July 19	13·5	13·0	12·9	.	12·7	.	15·0	13·0	12·8	.	12·6	12·6(13)
,, 20	12·8	13·1	12·5	.	12·8	.	17·2	13·1	12·7	.	12·7	12·7(13)
,, 21	16·9	13·7	13·2	.	12·4	.	.	.	.	.	.	.
,, 22†	.	.	.	.	.	.	15·6	11·8	11·6	.	11·8	.
,, 23†	15·0	12·9	11·4	.	11·8	11·8(11)	.	.	.	.	.	.
Aug. 2	13·8	12·7	13·0	.	12·8	.	19·4	12·5	12·9	.	12·7	.
,, 3	14·6	12·8	12·9	.	12·6	.	15·0	13·7	12·6	.	12·2	12·7(13)
,, 4†	17·4	13·3	13·2	.	12·9	.	20·0	13·9	12·7	.	12·4	12·7(13)
,, 5	16·9	13·9	13·0	.	12·8	.	.	.	.	.	.	.
,, 16	12·2	14·0	13·7	.	13·2	.	15·0	13·9	13·8	.	13·2	13·2(13)
,, 18	12·9	13·0	12·9	.	12·3	12·3(11)	12·8	13·1	12·7	.	12·4	12·4
,, 20	14·8	13·0	12·6	.	12·2	.	16·1	12·4	12·3	.	12·2	12·1(12)
,, 21	13·3	12·7	12·4	.	12·3	.	.	.	.	.	.	.
Sept, 16	.	.	.	.	.	.	20·0	13·7	13·5	.	13·4	.
,, 17	.	.	.	.	.	.	16·1	13·8	13·5	.	13·4	.
,, 19	14·6	13·7	13·6	.	13·4	.	14·6	14·0	13·3	.	13·2	13·2(12)
,, 20	14·3	13·6	13·6	.	13·3	.	14·5	13·7	13·5	.	13·4	13·4(11)
,, 22	13·9	13·8	13·2	.	13 2	.	16·7	13·7	13·7	.	12·9	12·9(11)
,, 23	12·2	13·5	13·2	.	13·2	.	15·0	13·5	13·0	.	12·9	.
,, 24	17·7	13·3	13·0	.	13·0	13·0(12)	.	.	.	.	.	.
,, 25	12·6	12·8	12·6	.	12·6	12·6(13)	13·9	13·0	12·9	12·9(6)	.	.
Oct. 31	7·7	9·7	9·7	.	9·7	9·7(12)	7·9	9·7	9·7	.	9·8	.
Nov. 1	8·8	9·6	9·7	.	9·8	9·8(11)	9·0	9·6	9·7	.	9·7	.
,, 2	10·0	9·5	9·6	.	9·6	9·6(11)	8·3	9·0	9·7	.	10·0	.
,, 3	4·3	8·7	10·4	.	10·4	10·4(12)	.	.	.	.	.	.
Dec. 5	5·2	5·9	6·7	.	7·3	7·3(11)	6·1	5·8	6·8	.	7·2	.
,, 6	0·5	4·3	7·5	.	7·8	7·8(12)	1·7	4·1	7·6	.	7·7	.
,, 7	0·0	4·5	7·3	.	7·7	7·7(11)	0·0	4·2	7·4	.	7·7	.
,, 8	1·6	5·7	8·0	.	8·0	8·0(12½)	.	.	.	.	.	.
1891.												
Jan. 28	6·7	3·8	4·7	.	4·9	4·9(11)	7·8	3·8	4·6	4·7(9)	.	.
,, 29	6·7	3·9	4·8	.	5 0	5·0(11)	5·6	3·8	4·7	5·0(9)	.	.
,, 30	5·0	3·9	4·8	.	5·0	5·0(11)	7·2	3·9	4·9	5·0(9)	.	.
,, 31	5·7	4·1	4·8	.	5·0	.	5·6	4·0	4·9	5·0(9)	.	.
Feb. 1	4·4	4·0	4·9	.	5·0	.	5·7	4·2	4·9	5·0	.	.
,, 27	3·4	5·7	5·7	.	5·7	.	6·6	5·7	5·6	.	5·7	5·7(13)
,, 28	6·3	5·5	5·5	.	5·7	.	8·3	5·5	5·5	.	5·7	5·7(12)

Observation at Cromarty.

13. INVERGORDON, CROMARTY FIRTH—*continued.*

Date.		9 A.M.						3 P.M.					
		Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
Mar.	1	10·6	5·7	5·7	.	5·8	.	12·2	6·0	5·9	.	6·0	6·0(12)
,,	2	6·4	5·8	6·0	.	6·0	6·0(11)	3·8	5·6	5·7	.	5·9	5·9(12)
,,	3	3·3	5·4	5·5	.	5·8	5·8(12)	2·8	5·0	5·2	.	5·3	5·3(13)
,,	4	9·3	5·1	5·3	.	5·3	5·3(12)	8·9	5·2	5·3	.	5·4	5·4(12)
,,	5	5·5	5·1	5·3	.	5·6	5·6(13)	.	.	.	.	.	.
Apr.	19	6·1	6·7	6·2	.	5·7	.	9·8	6·9	6·2	.	5·7	.
,,	20	6·3	7·0	6·2	.	5·8	.	8·9	6·9	6·8	.	6·5	.
,,	21	4·6	6·9	6·8	.	6·5	.	9·6	6·8	6·9	.	6·5	.
,,	22	6·3	7·1	6·9	.	6·6	.	.	.	.	.	.	.
Sept.	4	12·8	13·0	12·7	.	12·6	.	16·8	13·4	12·7	.	12·5	12·4(13)
,,	5	12·2	12·9	12·7	.	12·4	.	14·5	11·9	12·6	.	12·3	12·3(12)
,,	6	10·6	12·7	12·4	.	12·4	.	13·4	11·9	12·2	.	11·9	11·9(12)
,,	7	13·4	12·4	12·4	.	11·9	.	12·2	12·6	12·1	.	11·9	11·9(12)
,,	8	11·1	12·3	12·2	.	12·1	.	.	.	.	.	.	.
,,	26	13·0	11·5	11·8	.	11·9	11·9(12)	12·8	11·6	11·7	.	11·9	11·9(12)
,,	27	11·1	11·8	11·7	.	11·9	11·9(12)	13·3	12·3	11·8	.	11·9	11·9(12)
,,	28	13·5	11·8	11·5	.	11·6	11·6(12)	17·1	11·9	11·7	.	11·7	11·7(11)
,,	29	12·5	11·8	11·7	.	11·8	11·8(12)	11·1	11·9	11·8	.	11·8	11·8(11)
Oct		7·2	8·3	10·4	.	10·6	10·6(12)	10·4	9·1	10·7	.	10·7	10·7(11)
,,		5·8	8·2	10·5	.	10·7	10·7(12)	10·6	9·5	10·6	.	10·8	10·8(12)
,,		7·9	9·5	10·5	.	10·7	10·7(12)	9·9	9·4	10·4	.	10·8	.
,,		2·4	9·3	10·2	.	10·5	10·5(12)	8·4	9·1	10·2	.	10·5	.
,,		3·3	9·2	9·5	.	10·2	10·2(12)	8·3	9·1	9·6	.	10·5	.
,,		8·2	9·3	9·3	.	10·0	10·0(12)	.	.	.	.	.	.
Dec		10·0	6·7	7·3	.	7·3	.	11·8	6·9	7·5	.	7·4	7·4(11)
,,		7·2	6·8	7·5	.	7·4	.	8·3	6·6	7 5	.	7·5	7·5(11)
,,		8·3	6·4	7·3	.	7·4	7·4(11)	.	.	.	.	.	.

OFF GARROCH HEAD.

Date.	Hour.	Air.	Surf.	5 fms.	10 fms.	15 fms.	20 fms.	25 fms.	30 fms.	35 fms.	40 fms.	45 fms.	50 fms.	Over 50 fathoms.
1887.														
May 4*	9 a.m.	7·9	8·0	7·6	7·4	7·2	6·8	6·7	6·6	6·5	6·5	.	.	.
,, 26*	,,	11·7	8·4	7·9	7·6	7·3	7·2	7·0	6.9	6·8	6·7	6·6	6·6	.
Oct. 25*	3 p.m.	7·2	10·8	10·9	10·8	11·1	11·1	11·2	11·3	11·4	11·4	.	.	.
,, 31*	,,	13·7	10·3	10·8	11·1	11·0	11·1	11·1	11·1	11·1	11·2	11·2	.	.
Nov. 10*	,,	7·2	9·6	9·6	9·8	10·0	10·2	10·2	10·2	10·4	10·5	10·7	10·8	10·3 (54)
1888.														
Jan. 13*	,,	5·1	6·5	7·3	7·3	7·3	7·4	7·3	7·4	7·3	7·4	.	.	.
,, 16*	,,	4·6	6·6	7·1	7·3	.	7·4	.	7·6	.	7·5	.	7·6	7·6 (60 & 64)
Feb. 29*	,,	4·5	5·3	5·6	6·1	.	6·5	.	6·6	.	.	.	.	.
May 11*	9 a.m.	8·3	8·2	7·4	7·4	7·1	6·5	.	6·2	.	6·2	.	6·1	.

OFF BRODICK.

1887.														
Oct. 27*	3 p.m.	12·0	11·1	11·1	11·1	11·2	11·2	11·3	11·3	11·4	11·5	11·5	11·5	11·6 (55 & 60)
1888.														
Dec. 19*	9 a.m.	9·4	7·7	7·8	8·2	8.3	8·3	.	8·4	.	8·5	8·5	.	.

LARGYBEG AND NEIGHBOURHOOD.

Date.	Hour.	Air.	Surf.	5 fms.	10 fms.	15 fms.	20 fms.	25 fms.	30 fms.	35 fms.	40 fms.	45 fms.	50 fms.	Over 50 fathoms.
1887.														
Apr. 27*	9 a.m.	7·5	7·1	7·0	6·7	6·6	6·3	6·2	.	.	.	.	.	.
May 4*	3 p.m.	11·3	9·1	9·0	8·8	8·7	8·4	8·2	8·0	7·8	7·8†	.	.	.
Oct. 5*	9 a.m.	12·3	12·2	12·3	12·3	12·5	12·1	12·1	11·9	11·8	11·8	11·9	11·9	.
,, 10*	3 p.m.	10·0	13·2	13·0	12·8	12·3	12·2	12·0	11·9	11·8	11·8	.	11·7	.
Nov. 17*	9 a.m.	7·2	9·9	9·9	10·0	10·2	10·2	10·2	10·3	10·4†	.	.	.	.
1888.														
Jan. 11*	3 p.m.	7·2	7·3	7·3	7·4	7·3	7·4	7·3	7·4	7·4	7·4†	.	.	.
,, 12*	9 a.m.	4·4	7·1	7·2	7·3	7·3	7·4	7·3	7·4	7·3	7·4	7·4†	7·5	7·4 (52)
,, 13*	,,	6·4	7·2	7·2	7·3	7·2	7·3	7·3	7·5	7·5	7·6	7·7	7·7	7·8 (55) 7·9 (60 & 63)
,, 24*	3 p.m.	6·2	7·2	7·2	7·2	.	7·2	.	7·2	.	7·2†	.	.	.
Feb. 28*	9 a.m.	3·0	5·9	6·0	6·1	.	6·3	.	6·5	6·6	.	.	.	.
Oct. 19*	,,	11·1	10·8	10·8	10·8	10·8	10·8	.	11·0	.	11·0	11·0	.	.
Dec. 18*	3 p.m.	7·4	7·3	7·5	7·8	7·9	7·9	.	8·1	.	8·2	.	8·8†	.

† 3 fathoms less than number at head of column. ‡ 2 fathoms less than number at head of column.
¶ 2 fathoms more than number at head of column.

CARRADALE.

Date.	Hour.	Air.	Surf.	5 fms.	10 fms.	15 fms.	20 fms.	25 fms.	30 fms.	35 fms.	40 fms.	45 fms.	50 fms.	Over 50 fathoms.
1887.														
Apr. 25*	3 p.m.	8·0	6·5	6·6	6·4	6·3	6·2	6·2	6·1	6·0	.	.	.	.
May 12*	9 a.m.	10·0	7·8	7·7	7·6	7·3	7·3	7·2	7·1	7·0	6·9†	6·9‡	.	.
Nov 3*	3 p.m.	7·9	10·0	10·0	10·3	10·6	10·7	10·7	10·8	10·8	10·8	10·9	11·1	11·1 (58 & 60)

OFF LOCH RANZA.

1887.														
May 12*	3 p.m.	13·2	7·8	7·5	7·1	6·9	6·7	6·4	6·4	6·2	.	.	.	.

† 38 fathoms. ‡ 42 fathoms.

9. PHYSICAL OBSERVATIONS, 1892.

I. FIXED STATIONS.

TABLE I.—Temperature of Water—Abertay Light Vessel.

Ten-day Periods.

Period.	Observations, 9 A.M.				Observations, 3 P.M.			
	Air.	Surf.	3 fms.	Bot.	Air.	Surf.	3 fms.	Bot.
1892.								
Jan. 1–10	2·2	5·3	5·2	6·0	2·9	5·3	5·8	5·8
,, 11–20	1·5	3·3	4·2	4·3	2·8	4·6	5·1	5·1
,, 21–31	4·7	4·4	5·1	5·1	6·4	4·7	5·1	5·2
Feb. 1–10	3·6	4·5	4·9	4·9	6·0	4·4	5·0	4·8
,, 11–20	0·9	3·9	3·9	3·9	3·4	4·0	4·2	4·2
,, 21–29	3·3	3·2	3·9	3·9	5·5	3·5	4·0	4·1
Mar. 1–10	1·4	3·6	4·0	4·0	4·3	3·7	4·1	4·1
,, 11–20	3·2	3·4	3·7	3·8	5·4	3·9	4·1	4·1
,, 21–31	4·0	3·9	4·2	4·2	8·0	4·2	4·4	4·4
Apr. 1–10	7·0	4·8	5·0	4·9	10·6	5·0	5·2	5·2
,, 11–20	3·9	5·3	5·7	5·8	7·1	5·2	5·6	5·7
,, 21–30	7·8	5·5	5·7	5·8	9·8	5·8	6·2	6·1
May 1–10	9·1	6·3	6·5	6·3	10·5	6·5	6·8	6·8
,, 11–20	10·2	7·7	7·9	7·8	12·0	7·4	7·6	7·5
,, 21–31	11·5	8·5	8·6	8·6	15·9	8·2	8·3	8·2
June 1–10	13·2	9·4	9·4	8·9	16·1	10·2	9·8	9·6
,, 11–20	10·5	9·5	9·7	9·6	12·4	9·7	9·8	9·8
,, 21–30	13·9	10·6	10·6	10·6	13·1	10·2	10·3	10·3
July 1–10	* ..	..	..	..	..	..	..	..
,, 11–20	12·5	10·3	10·4	10·4	14·1	10·8	10·9	10·8
,, 21–31	15·5	12·2	12·0	11·9	17·9	11·4	11·4	11·3
Aug. 1–10	13·1	11·9	12·2	11·9	16·3	12·1	12·2	12·0
,, 11–20	14·1	11·5	11·9	12·0	16·7	12·2	12·3	12·2
,, 21–31	13·6	12·6	12·7	12·4	15·9	12·0	12·0	12·0
Sept. 1–10	11·8	11·4	11·9	12·0	15·4	11·7	12·2	12·0
,, 11–20	11·9	11·2	11·7	11·8	13·6	11·3	11·9	11·8
,, 21–30	10·4	10·6	11·1	11·2	13·3	10·5	11·3	11·3
Oct. 1–10	9·3	9·6	10·4	10·4	11·0	10·0	10·8	10·9
,, 11–20	6·9	8·3	9·4	9·5	10·0	8·9	9·9	10·1
,, 21–31	5·2	7·5	8·5	8·6	7·5	7·8	8·9	9·0
Nov. 1–10	6·6	7·5	8·0	8·3	9·1	8·2	8·9	8·9
,, 11–20	6·7	7·5	8·5	8·7	8·3	7·2	8·7	9·0
,, 21–30	6·2	7·2	8·2	8·4	6·8	7·3	8·4	8·6
Dec. 1–10	0·8	5·4	6·2	6·4	2·5	5·5	6·6	6·8
,, 11–20	4·7	4·9	5·9	6·2	5·5	5·0	5·7	6·0
,, 21–31	1·5	4·9	6·6	6·8	3·2	5·0	6·3	6·5

* Vessel at Dundee for repairs from 27th June to 14th July.

TABLE II.—Temperature of Water—Abertay Light Vessel.

Monthly Means.

Month.	Observations, 9 A.M.				Observations, 3 P.M.			
	Air.	Surf.	3 fms.	Bot.	Air.	Surf.	3 fms.	Bot.
1892.								
January	2·8	4·3	5·1	5·1	4·0	4·9	5·3	5·4
February	2·6	3·9	4·2	4·2	5·0	4·0	4·4	4·4
March	2·9	3·6	3·9	4·0	5·9	3·9	4·2	4·2
April	6·2	5·2	5·3	5·5	9·2	5·3	5·7	5·7
May	10·3	7·5	7·6	7·5	12·8	7·4	7·5	7·5
June	12·5	9·8	9·9	9·7	13·9	10·0	10·0	9·9
July	14·0	11·2	11·2	11·1	16·0	11·1	11·2	11·1
August	13·6	12·0	12·3	12·1	16·3	12·1	12·2	12·1
September	11·4	11·1	11·5	11·7	14·1	11·2	11·8	11·7
October	7·1	8·5	9·4	9·5	9·5	8·9	9·9	10·0
November	6·5	7·4	8·2	8·5	8·1	7·6	8·7	8·8
December	2·3	5·1	6·2	6·5	3·7	5·2	6·2	6·4
Mean	7·7	7·5	7·9	8·0	9·9	7·6	8·1	8·1

TABLE III.—TEMPERATURE OF WATER—NORTH CARR LIGHT VESSEL.

Ten-day Periods.

Period	Observations, 9 A.M.				Observations, 3 P.M.			
	Air.	Surf.	12 fms.	Bot. 24 fms.	Air.	Surf.	12 fms.	Bot. 24 fms.
1892.								
Jan. 1–10	2·5	5·6	5·9	6·3	2·1	5·7	6·0	6·5
, 11–20	3·5	4·5	4·5	5·3	3·7	4·4	4·6	5·3
,, 21–31	5·2	4·0	5·5	5·6	6·1	4·3	5·5	5·8
Feb. 1–10	4·5	3·5	5·0	5·6	4·8	3·6	5·3	5·5
,, 11–20	2·2	3·1	4·4	4·8	3·9	3·2	4·6	5·2
,, 21–29	4·5	3·1	4·1	4·6	5·0	3·3	4·3	4·6
Mar. 1–10	1·7	2·6	2·7	4·1	2·2	3·0	3·1	4·3
,, 11–20	3·9	3·1	3·8	4·1	4·5	3·4	3·8	4·2
,, 21–31	3·3	4·1	4·7	4·4	7·8	4·2	5·0	4·6
Apr 1–10	8·1	4·2	5·3	4·7	8·4	4·5	5·7	5·0
,, 11–20	7·8	4·4	5·1	5·3	6·7	4·5	5·5	5·4
,, 21–30	8·3	4·6	5·5	5·5	8·3	4·8	5·7	5·5
May 1–10	8·3	5·6	6·5	6·2	8·9	5·3	6·6	6·8
,, 11–20	10·0	6·3	7·7	6·7	10·6	6·9	7·5	7·0
,, 21–31	10·6	7·9	8·4	7·6	12·2	8·0	8·9	8·3
June 1–10	14·5	8·7	10·0	8·2	13·9	9·0	8·9	8·1
,, 11–20	10·6	9·3	9·5	9·0	10·6	9·5	9·6	9·0
,, 21–30	13·3	9·7	9·8	9·3	13·3	10·0	10·0	9·6
July 1–10	13·9	10·1	10·2	9·4	15·0	10·3	10·6	9·9
,, 11–20	13·3	10·4	10·9	10·0	13·9	10·6	11·0	10·3
,, 21–31	14·5	12·1	11·9	10·8	15·6	12·1	12·4	10·9
Aug. 1–10	14·5	11·3	11·6	10·8	14·5	11·8	12·3	11·1
,, 11–20	13·9	11·4	12·0	11·3	15·6	11·7	12·1	11·2
,, 21–31	15·6	11·9	12·2	11·9	14·5	12·2	12·2	11·9
Sept. 1–10	12·8	11·8	12·5	11·7	13·3	12·0	12·8	12·0
,, 11–20	12·2	11·6	11·5	11·5	13·3	11·6	11·5	11·7
,, 21–30	11·1	10·9	10·8	11·2	13·3	11·0	10·9	11·2
Oct. 1–10	9·5	10·2	10·3	10·9	10·6	10·3	10·7	10·9
,, 11–20	7·8	9·6	9·6	10·3	8·9	9·6	9·8	10·5
,, 21–31	6·7	8·6	8·8	9·6	8·3	8·5	8·9	9·5
Nov. 1–10	8·3	8·7	8·5	9·2	10·6	8·5	8·9	9·3
,, 11–20	8.3	8·1	7·8	8·8	9·5	8·1	7·9	8·8
,, 21–30	6·7	7·8	7·1	8·3	6·7	7·8	7·2	8·2
Dec. 1–10	2·2	6·4	5·0	7·3	2·8	6·4	6·4	7·2
,, 11–20	6·1	5·6	6·0	7·3	5·6	5·4	5·8	7·1
,, 21–31	2·8	5·0	5·4	6·7	3·9	5·4	5·2	6·8

TABLE IV.—TEMPERATURE OF WATER—NORTH CARR LIGHT VESSEL.

Monthly Means.

Month.	Observations, 9 A.M				Observations, 3 P.M.			
	Air.	Surf	12 fms.	Bot. 24 fms.	Air.	Surf.	12 fms.	Bot. 24 fms.
1892.								
January	3·7	4·7	5·3	5·7	4·0	4·8	5·4	5·9
February	3·7	3·2	4·5	5·0	4·6	3·4	4·7	5·1
March	3·0	3·3	3·7	4·2	4·8	3·5	4·0	4·4
April	8·1	4·4	5·3	5·2	7·8	4·6	5·6	5·3
May	9·6	6·6	7·5	6·8	10·6	6·7	7·7	7·4
June	12·8	9·2	9·8	8·8	12·6	9·5	9·5	8·9
July	13·9	10·9	11·0	10·1	14·8	11·0	11·3	10·4
August	14·7	11·5	11·9	11·3	14·9	11·9	12·2	11·4
September	12·0	11·4	11·6	11·5	13·3	11·5	11·7	11·6
October	8·0	9·5	9·6	10·3	9·3	9·5	9·8	10·3
November	7·8	8·2	7·8	8·8	8·9	8·1	8·0	8·8
December	3·7	5·7	5·5	7·1	4·1	5·7	5·8	7·0
Mean	8·4	7·4	7·8	7·9	9·1	7·5	8·0	8·0

TABLE V.—TEMPERATURE OF WATER—EAST COAST.

Ten-day Periods.

Period.	1. OXCAR Lighthouse.				2. BELL ROCK Lighthouse.				3. DUNBAR Harbour.			
	9 A.M.		3 P.M.		9 A.M.		3 P.M.		10 A.M.		3 P.M.	
	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.
1892.												
Jan. 1–10	2·5	4·4	3·7	4·9	4·1†	6·4†	0·5†	5·6†	2·9	4·8	..	..
,, 11–20	1·5	3·4	2·4	3·6	1·2‡	5·3‡	..	..	3·1	4·8	..	..
,, 21–31	5·6	3·9	6·4	4·2	7·1‡	4·8‡	7·2‡	4·9‡	7·2	5·0	7·2	4·7
Feb. 1–10	4·2	4·5	6·7	4·8	4·3	5·0	6·5†	5·0†	6·1	4·8	7·2	4·9
,, 11–20	2·8	3·5	5·0	4·7	2·9‡	4·6‡	9·2†	5·0†	6·3	4·6	1·9	3·9
,, 21–29	2·9	3·1	4·6	3·5	3·9†	4·2†	3·3†	4 2†	6·1	4·2	5·0	4·3
Mar. 1–10	0·9	2·7	3·4	3·0	1·1	4·0	2·8	4·1	3·1	3·8	2·9	3·9
,, 11–20	4·7	3·2	6·8	3·4	4·5‡	4·1‡	5·0†	4·1†	2·8	3·0	3·3	3·2
,, 21–31	3·7	3·6	6·7	4·2	5·0	4·2	8·3‡	4·5‡	11·4	4·5	..	..
Apr. 1–10	6·6	4·4	9·9	5·5	6·7	4·6	8·9	4·9	..	..	..	..
,, 11–20	5·1	5·4	6·4	5·4	3·9	5·1	7·2†	5·3†	..	..	..	..
,, 21–30	8·3	5·8	9·9	6·3	6·7	5·5	8·9‡	5·3‡	7·9	6·1	7·1	6·6
May 1–10	8·4	6·7	10·4	7·4	8·3‡	6·0‡	7·8	5·9	9·6	6·7	9·4	7·3
,, 11–20	9·7	8·6	10·7	8·4	9·5‡	6·6‡	10·6	6·6	8·3	7·5	8·9	7·2
,, 21–31	12·3	9·3	13·1	9·2	11·1‡	7·5‡	11·1‡	7·3‡	13·1	9·3	14·9	9·6
June 1–10	13·1	9·9	14·9	10·6	12·8	8·8	15·0‡	9·4‡	13·9	10·2	12·7	12·3
,, 11–20	9·3	10·1	11·6	10·4	8·9‡	8·7‡	8·9†	9·5†	10·5	10·5	9·3	9·4
,, 21–30	12·9	11·6	15·3	11·6	12·2‡	9·5‡	13·3	9·8	11·6	10·3	13·5	11·3
July 1–10	11·5	10·8	13·7	10·8	13·9	10·2	13 9	10·3	13·2	11·7	15·1	11·7
,, 11–20	11·8	10·8	12·5	11·2	11·1‡	10·4‡	12·8‡	10·7‡	..	..	..	..
,, 21–31	12·6	12·4	14·8	12·5	14·5	10·8	15·0	10·9	..	..	..	..
Aug. 1–10	12·9	12·3	14·6	12·5	12·2‡	10·8‡	13·3†	11·2†	13·4	12·3	13·2	12·5
,, 11–20	13·6	12·4	15·5	12·8	13·9	11·5	15·6	11·8	15·8	12·2	15·1	12·5
,, 21–31	13·8	12·7	15·0	12·8	14·5	11·9	15·6‡	12·0‡	14·5	12·3	14·4	12·2
Sept. 1–10	11·8	11·5	13·2	11·6	12·8	11·7	13·9‡	11·5‡	11·6	11·4	12·7	11·5
,, 11–20	12·2	10·6	13·0	11·5	12·8	11·4	12·2‡	11·4‡	12·2	11·2	12·6	11·4
,, 21–30	9·9	10·7	11·4	10·7	11·7‡	11·2‡	10·6‡	11·0‡	10·5	10·5	9·2	10·3
Oct. 1–10	8·3	9·9	9·9	10·2	8·9	10·6	10·0‡	10·7‡	9·3	10·0	8·9	10·0
,, 11–20	6·7	8·7	9·6	9·2	7·2‡	10·0‡	7·8†	10·0†	6·4	8·7	8·3	9·1
,, 21–31	5·3	7·5	8·2	7·8	6·7	8·7	7·8	8·7	10·3	8·3	7·7	7·5
Nov. 1–10	7·4	7·6	10·6	8·0	7·2	8·4	8·3	8·4	7·2	7·7	8·4	8·0
,, 11–20	6·4	7·6	8·2	8·2	6·7	8·2	7·2‡	8·4‡	6·5	7·9	6·5	7·7
,, 21–30	5·7	7·4	6·1	7·5	5·6‡	7·9‡	..	..	5·4	7·4	5·6	7·5
Dec. 1–10	–2·6	4·9	2·4	5·2	1·7	6·3	2·8†	6·4†	3·1	5·3	1·8	5·1
,, 11–20	6·1	5·4	6·3	5·2	5·0	5·6	..	..	5·1	5·2	5·4	5·2
,, 21–31	–0·9	4·7	1·1	4·5	2·8	5·5	3·3	5·6	2·9	4·7	2·1	4·5

† Mean of not more than 3 observations. ‡ Mean of not more than 6 observations.

TABLE VI.—TEMPERATURE OF WATER—EAST COAST.

Monthly Means.

Month.	1. OXCAR Lighthouse.				2. BELL ROCK Lighthouse.				3. DUNBAR Harbour.			
	9 A.M.		3 P.M.		9 A.M.		3 P.M.		10 A.M.		3 P.M.	
	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.	Air.	Surf.
1892.												
January	3·2	3·9	4·2	4·2	4·1	5·5	3·8	5·3	4·4	4·9	..	..
February	3·3	3·7	5·4	4·3	3·7	4·6	6·3	4·7	6·2	4·5	4·7	4·4
March	3·1	3·2	5·6	3·5	3·5	4·1	5·4	4·2	5·8	3·8	3·1	3·6
April	6·7	5·2	8·7	5·7	5·8	5·1	8·3	5·2	7·9	6·1	7·1	6·6
May	10·1	8·2	11·4	8·3	9·6	6·7	9·8	6·6	10·3	7·8	11·1	8·0
June	11·8	10·5	13·9	10·9	11·3	9·0	12·4	9·6	12·0	10·3	11·8	11·0
July	12·0	11·3	13·7	11·5	13·2	10·5	13·9	10·6	13·2	11·7	15·1	11·7
August	13·4	12·5	15·0	12·7	13·5	11·4	14·8	11·7	14·6	12·3	14·2	12·4
September	8·0	10·9	12·5	11·3	12·4	11·4	12·2	11·3	11·4	11·0	11·5	11·1
October	6·8	8·7	9·2	9·1	7·6	9·8	8·5	9·8	8·7	9·0	8·3	8·9
November	6·5	7·5	8·3	7·9	6·5	8·2	7·7	8·4	6·4	7·7	6·8	7·7
December	0·9	5·0	3·3	5·0	3·2	5·8	3·1	6·0	3·7	5·1	3·1	4·9
Mean	7·2	7·6	9·3	7·9	7·9	7·7	8·8	7·8	8·7	7·8	8·8	8·2

TABLE VII.—TEMPERATURE OF WATER—WEST COAST.

Ten-day Periods.

Period.	1. ARDRISHAIG.				2. BRODICK.		3. W. LOCH TARBERT.			4. STRANRAER.		
	9 A.M.		3 P.M.		10 A.M.	4 P.M.	3 P.M.			9 A.M.		
	Air.	Surf.	Air.	Surf.	Surf.	Surf.	Air.	Surf.	Bot.	Air.	Surf.	Bot.
1892.										Inside Watch room.		
Jan. 1-10	0·0	7·1	1·1	7·0	6·6	6·6	2·7	3·7	3·8		3·3	3·4
,, 11-20	0·0	4·5	2·2	5·0	6·4	6·6	3·1	3·9	4·1		1·4	1·4
,, 21 31	4·5	5·1	5·6	6·2	6·6	6·8	6·7	4·8	4·9	..	3·2	3·2
Feb. 1-10	3·9	6·7	5·6	6·8	6·2	6·4	6·0	5·3	5·4	7·2	3·9	4·0
,, 11-20	2·8	6·3	4·5	6·3	5·5	5·6	3·6	5·0	5·1	5·6	4·3	4·5
,, 21-29	3·9	4·7	5·0	5·3	5·1	5·4	5·9	4·9	5·1	6·1	3·4	3·6
Mar. 1-10	0·6	4·8	2·8	5·3	5·2	5·4	2·1	3·1	3·3	4·5	2·6	2·8
,, 11-20	2·8	4·0	5·6	4·9	5·5	5·7	6·2	4·6	4·7	6·7	2·9	3·2
,, 21-31	6·7	6·1	10·0	6·2	5·9	6·1	7·1	6·3	6·5	10·0	5·3	5·4
Apr. 1-10	11·1	7·6	13·9	7·7	6·7	6·9	8·9	8·1	8·0	13·3	7·1	7·1
,, 11-20	5·6	7·4	10·0	7·5	6·6	6·9	7·3	7·9	7·8	13·3	7·4	7·6
,, 21-30	9·5	7·1	11·1	7·3	6·9	7·3	8·7	9·1	9·7	15·0	8·2	8·4
May 1-10	10·6	9·1	15·6	9·6	7·5	8·3	13·4	11·1	11·0	16·7	8·7	9·0
,, 11-20	15·0	9·5	18·9	9·6	8·6	9·3	12·8	12·1	11·9	17·3	10·8	11·0
,, 21-31	12·8	10·0	16·1	10·1	8·5	9·1	12·7	12·3	12·8	20·0	11·5	11·7
June 1-10	14·5	11·1	16·7	11·3	10·2	10·7	15·6	13·8	12·6	23·9	13·0	13·2
,, 11-20	12·2	10·9	14·5	11·0	11·2	11·2	11·9	12·2	11·7	20·6	12·2	12·4
,, 21-30	15·0	11·4	18·9	11·7	11·6	12·0	14·9	15·3	14·5	22·8	14·3	14·5
July 1-10	15·0	11·3	16·1	11·4	10·9	11·2	13·7	14·8	14·6	20·6	13·9	14·1
,, 11-20	15·0	12·4	16·7	12·9	12·4	12·7	14·5	14·3	13·8	20·6	13·8	14·0
,, 21 31	17·8	12·0	19·5	12·6	13·3	13·8	15·8	15·9	15·4	23·3	15·3	15·5
Aug. 1-10	15·6	11·2	18·3	11·9	12·8	13·2	15·4	15·9	15·7	20·6	15·6	15·8
,, 11-20	16·7	12·6	20·0	12·6	12·4	12·8	15·1	15·4	15·4	20·0	14·6	14·8
,, 21-31	15·0	13·1	17·2	13·0	13·1	13·4	14·8	14·9	14·9	20·0	14·3	14·7
Sept. 1-10	15·0	12·0	14·5	11·9	12·3	12·5	13·3	13·3	13·4	17·2	12·4	12·5
,, 11-20	..	..	..	..	11·7	11·8	12·1	12·7	12·8	17·2	12·1	12·4
,, 21-30	..	..	..	..	11·1	11·4	10·9	11·1	11·4	12·8	11·1	11·2
Oct. 1-10	11·7	10·4	12·8	10·4	9·9	10·2	9·9	10·6	10·7	11·1	9·0	9·2
,, 11-20	9·5	9·3	11·1	9·5	9·6	10·1	8·8	9·2	9·4	9·5	7·2	7·4
,, 21-31	5·0	8·6	8·3	8·7	9·4	9·7	7·7	7·4	7·1	7·2	5·9	6·2
Nov. 1-10	8·9	9·6	9·5	9·6	9·8	10·0	9·2	8·0	7·9	8·9	7·4	7·6
,, 11-20	8·3	8·9	8·9	9·0	9·4	9·6	8·3	8·6	8·6	8·3	8·0	8·3
,, 21-30	6·1	7·7	6·7	7·7	8·0	8·3	6·3	7·3	7·5	7·2	6·5	6·7
Dec. 1-10	0·6	6·3	1·7	6·4	7·3	7·4	2·7	5·1	5·5	3·9	3·4	3·6
,, 11-20	5·0	7·7	6·7	7·8	7·2	7·4	6·8	5·4	5·4	6·7	4·6	4·8
,, 21-31	2·8	6·5	3·9	6·5	6·4	6·6	3·3	4·9	5·0	3·3	3 8	4·1

TABLE VIII.—TEMPERATURE OF WATER—WEST COAST.

Monthly Means.

Month.	ARDRISHAIG.				2. BRODICK.		3. W. LOCH TARBERT.			4. STRANRAER.		
	9 A.M.		3 P.M.		10 A.M.	4 P.M.	3 P.M.			9 A M.		
	Air.	Surf.	Air.	Surf.	Surf.	Surf.	Air.	Surf.	Bot.	Air.	Surf.	Bot.
1892.										Inside Watch room.		
January	1·5	5·6	3·0	6·1	6·5	6·7	4·2	4·1	4·3		2·6	2·7
February	3·5	5·9	5·0	6·1	5·6	5·8	5·2	5·1	5·2	6·3	3·9	4·0
March	3·4	5·0	6·1	5·5	5·5	5·7	5·1	4·7	4·8	7·1	3·6	3·8
April	8·7	7·4	11·7	7·5	6·7	7·0	8·3	8·4	8·5	13·9	7·6	7·7
May	12·8	9·5	16·9	9·8	8·2	8·9	13·0	11·8	11·9	18·0	10·3	10·6
June	13·9	11·1	16·7	11·3	11·0	11·3	14·1	13·8	12·9	22·4	13·2	13·4
July	15·9	11·9	17·4	12·3	12·2	12·6	14·7	15·0	14·6	21·5	14·3	14·5
August	15·8	12·3	18·5	12·5	12·8	13·1	15·1	15·4	15·3	20·2	14·8	15·1
September	15·0	12·0	14·5	11·9	11·7	11·9	12·1	12·4	12·5	15·7	11·9	12·0
October	8·7	9·4	10·7	9·5	9·6	10·0	8·8	9·1	9·1	9·3	7·7	7·6
November	7·8	8·7	8·4	8·8	9·1	9·3	7·9	8·0	8·0	8·1	7·3	7·5
December	2·8	6·8	4·1	6·9	7·0	7·1	4·3	5·1	5·3	4·6	3·9	4·2
Mean	9·2	8·8	11·1	9·0	8·7	9·1	9·4	9·4	9·4	13·4	8·4	8·6

TABLE IX.—TEMPERATURE OF WATER—TARBERT AND STRANRAER.

Daily Records.

Date.	West Loch. Tarbert—3 P.M.			Loch Ryan. Stranraer—9 A.M.			Date.	West Loch. Tarbert—3 P.M.			Loch Ryan. Stranraer—9 A.M.		
	Surf.	Bot.	Air.	Surf.	Bot.	Air.		Surf.	Bot.	Air.	Surf.	Bot.	Air.
1892.							1892.						
Jan. 1	4·3	4·8	6·4	4·9	5·0	6·1	Mar. 1	5·1	5·6	4·0	3·6	3·8	42·0
,, 2	4·4	4·6	5·6	4·6	4·8	6·1	,, 2	3·9	3·8	1·0	2·6	3·0	39·0
,, 3	...	...	...	4·0	4·0	3·9	,, 3	2·2	2·2	0·8	2·9	3·2	39·0
,, 4	4·2	4·8	1·2	4·3	4·3	5·6	,, 4	3·2	3·6	3·0	2·3	2·4	38·0
,, 5	4·4	4·8	4·6	3·3	3·6	3·9	,, 5	3·0	3·2	2·0	2·6	2·6	40·0
,, 6	2·8	2·8	1·4	3·4	3·5	3·9	,, 6	...	...	...	2·6	2·7	40·0
,, 7	3·0	2·8	0·6	3·2	3·6	2·8	,, 7	3·2	3·4	2·0	2·3	2·5	38·0
,, 8	3·2	2·8	1·4	1·8	2·0	2·8	,, 8	3·2	3·4	4·0	3·1	3·2	42·0
,, 9	3·3	3·1	0·1	1·6	1·8	2·8	,, 9	2·6	2·8	0·3	2·8	3·0	39·0
,, 10	...	...	...	1·5	1·6	2·2	,, 10	2·2	2·4	1·8	1·2	1·3	42·0
,, 11	4·4	4·8	2·0	1·4	1·4	1·7	,, 11	3·8	3·4	5·0	1·7	1·8	42·0
,, 12	3·8	4·2	3·0	2·3	2·3	3·3	,, 12	3·2	3·4	2·4	2·0	2·2	40·0
,, 13	4·4	5·0	2·2	2·1	2·2	2·8	,, 13	...	...	...	2·2	2·2	42·0
,, 14	3·4	3·8	3·2	1·8	1·8	3·3	,, 14	3·7	3·8	5·0	2·3	2·4	43·0
,, 15	3·2	3·4	2·6	1·0	1·2	2·8	,, 15	4·0	3·8	4·0	2·4	2·4	42·0
,, 16	3·4	3·1	1·4	0·6	0·6	1·7	,, 16	3·9	4·0	5·0	2·6	3·0	42·0
,, 17	...	...	...	0·7	0·8	2·2	,, 17	3·6	4·0	6·3	2·9	3·1	43·0
,, 18	4·4	4·2	3·8	1·2	1·2	3·3	,, 18	7·4	7·8	11·0	3·7	3·9	50·0
,, 19	4·0	4·2	6·2	1·2	1·2	4·5	,, 19	7·6	7·8	10·8	5·2	5·8	53·0
,, 20	4·2	4·4	3·4	1·2	1·2	4·5	,, 20	...	...	...	4·5	4·9	48·0
,, 21	3·8	4·2	4·8	1·3	1·3	4·5	,, 21	5·8	6·2	8·0	4·6	4·8	45·0
,, 22	3·6	4·1	4·2	1·4	1·4	5·0	,, 22	6·2	6·4	7·0	4·8	4·9	49·0
,, 23	3·8	4·1	4·8	2·4	2·6	6·1	,, 23	7·2	7·4	9·0	5·1	5·2	52·0
,, 24	...	...	...	2·8	3·0	6·1	,, 24	6·6	6·6	8·2	5·5	5·7	51·0
,, 25	3·8	4·2	5·8	3·2	3·2	6·7	,, 25	6·4	6·6	6·0	6·0	6·2	53·0
,, 26	5·1	5·2	7·8	3·8	3·8	6·7	,, 26	6·4	6·2	4·6	6·1	6·2	53·0
,, 27	5·8	5·2	7·0	4·2	4·2	7·8	,, 27	...	...	...	5·8	5·9	50·0
,, 28	5·4	5·2	8·4	3·8	3·9	6·7	,, 28	6·0	5·9	5·8	4·6	5·0	49·0
,, 29	5·6	5·4	10·2	4·0	4·0	10·0	,, 29	6·0	6·0	6·6	5·0	5·2	50·0
,, 30	6·8	6·4	7·0	3·7	3·8	8·9	,, 30	6·8	7·1	6·8	5·3	5·4	50·0
,, 31	...	...	...	4·2	4·2	10·0	,, 31	6·4	6·6	9·0	5·4	5·4	53·0
Feb. 1	6·0	5·8	5·2	4·6	4·6	8·9	Apr. 1	7·0	7·2	9·8	5·5	5·4	54·0
,, 2	5·9	5·6	3·2	2·3	2·4	4·5	,, 2	8·0	7·4	10·2	6·2	6·2	55·0
,, 3	4·9	5·0	4·2	2·4	2·6	6·9	,, 3	...	...	...	6·3	6·4	56·0
,, 4	4·0	4·2	5·0	3·2	3·3	7·8	,, 4	7·9	7·8	11·0	6·8	6·9	56·0
,, 5	3·8	4·0	4·8	3·8	3·8	7·2	,, 5	8·0	7·9	8·6	7·0	7·1	56·0
,, 6	4·7	4·9	7·0	4·0	4·0	7·2	,, 6	8·6	8·0	11·4	7·2	7·2	56·0
,, 7	...	...	...	4·3	4·2	7·8	,, 7	8·2	8·4	8·8	7·6	7·8	58·0
,, 8	5·8	6·0	8·2	4·3	4·4	7·8	,, 8	8·6	8·8	14·2	7·8	7·9	58·0
,, 9	6·0	6·2	8·0	5·2	5·4	47·0	,, 9	9·1	9·2	10·4	8·2	8·2	59·0
,, 10	6·8	7·0	8·2	5·4	5·6	48·0	,, 10	...	...	...	8·3	8·4	59·0
,, 11	6·8	6·6	9·0	5·6	5·8	50·0	,, 11	9·4	9·1	13·8	8·6	8·8	61·0
,, 12	7·0	6·7	8·4	5·8	5·9	50·0	,, 12	7·9	7·8	5·0	8·8	9·0	60·0
,, 13	6·0	6·2	6·8	5·6	5·8	48·0	,, 13	7·6	7·8	6·0	6·0	6·3	50·0
,, 14	...	...	...	5·4	5·6	48·0	,, 14	7·4	7·2	5·0	6·6	6·8	56·0
,, 15	5·4	5·2	3·2	5·0	5·2	44·0	,, 15	7·4	7·2	5·0	7·2	7·4	54·0
,, 16	4·3	4·2	2·2	4·6	4·8	40·0	,, 16	7·6	7·4	5·8	6·8	7·0	56·0
,, 17	4·6	4·6	3·0	3·6	3·8	40·0	,, 17	...	...	...	6·4	7·1	54·0
,, 18	3·8	4·2	0·2	3·2	3·4	34·0	,, 18	7·8	8·0	8·0	7·0	7·2	53·0
,, 19	3·8	4·0	0·1	2·0	2·2	32·0	,, 19	7·8	7·6	7·8	7·9	7·4	58·0
,, 20	3·7	4·0	0·1	2·4	2·6	37·0	,, 20	8·1	8·2	9·8	8·4	8·6	60·0
,, 21	...	...	...	1·2	1·6	38·0	,, 21	8·8	9·0	8·2	8·0	8·2	57·0
,, 22	3·8	4·2	4·8	2·2	2·4	40·0	,, 22	11·0	9·6	11·4	9·0	9·4	62·0
,, 23	4·5	4·6	5·4	3·2	3·4	43·0	,, 23	9·8	9·6	8·2	9·0	9·2	64·0
,, 24	4·6	4·7	6·7	4·0	4·2	45·0	,, 24	...	...	...	8·8	9·0	60·0
,, 25	5·6	6·0	7·2	4·1	4·3	44·0	,, 25	10·0	9·6	7·2	8·0	8·2	61·0
,, 26	5·9	6·1	7·8	4·2	4·3	47·0	,, 26	10·8	10·0	9·8	8·2	8·0	57·0
,, 27	4·8	5·0	4·0	4·2	4·5	45·0	,, 27	9·2	9·8	7·1	9·0	9·2	58·0
,, 28	...	...	...	3·8	4·0	45·0	,, 28	9·3	9·9	9·6	6·8	7·0	55·0
,, 29	5·4	5·4	5·8	3·5	3·8	43·0	,, 29	9·8	9·6	8·8	7·4	8·1	55·0
							,, 30	9·0	8·9	7·9	7·6	7·8	62·0

TABLE IX.—TEMPERATURE OF WATER—*continued.*

Daily Records.

Date.	West Loch. Tarbert—3 p.m.			Loch Ryan. Stranraer—9 a.m.			Date.	West Loch. Tarbert—3 p.m.			Loch Ryan. Stranraer—9 a.m.		
	Surf.	Bot.	Air.	Surf.	Bot.	Air.		Surf.	Bot.	Air.	Surf.	Bot.	Air.
1892.							1892.						
May 1	...	...	...	8·4	9·2	62·0	July 1	15·0	14·8	14·8	15·0	15·1	79·0
,, 2	10·8	10·4	16·4	9·0	9·2	64·0	,, 2	15·2	15·0	13·0	14·8	15·0	65·0
,, 3	10·4	10·6	11·0	7·3	8·1	50·0	,, 3	...	...	...	14·4	14·6	69·0
,, 4	10·6	10·2	13·4	7·0	7·4	59·0	,, 4	16·0	15·4	13·8	14·0	14·2	74·0
,, 5	10·9	11·0	13·1	7·2	7·6	59·0	,, 5	15·8	15·2	13·2	14·0	14·2	68·0
,, 6	11·2	10·8	11·8	8·8	9·0	61·0	,, 6	14·8	14·0	12·2	13·8	14·0	66·0
,, 7	11·0	10·8	10·0	9·1	9·3	62·0	,, 7	13·8	14·4	13·2	13·4	13·6	64·0
,, 8	...	...	...	9·8	10·0	66·0	,, 8	13·6	13·4	13·5	13·2	13·4	63·0
,, 9	11·8	12·0	14·2	10·0	10·2	68·0	,, 9	14·3	14·4	15·8	13·2	13·4	73·0
,, 10	12·2	12·8	17·0	10·3	10·4	68·0	,, 10	...	...	...	13·4	13·6	72·0
,, 11	12·0	11·8	17·4	10·4	10·6	67·0	,, 11	15·6	14·2	18·4	14·1	14·2	75·0
,, 12	11·6	11·2	15·0	10·4	10·6	71·0	,, 12	13·8	13·6	14·2	13·4	13·6	72·0
,, 13	12·2	12·2	13·0	11·2	11·4	62·0	,, 13	13·8	13·2	15·4	13·6	13·8	73·0
,, 14	11·8	11·8	11·0	11·2	11·4	68·0	,, 14	14·0	13·8	13·6	14·0	14·2	64·0
,, 15	...	...	...	11·0	11·2	64·0	,, 15	14·4	14·0	14·4	14·4	14·6	71·0
,, 16	11·6	11·6	11·2	10·6	10·8	57·0	,, 16	14·8	14·4	12·8	14·4	14·6	74·0
,, 17	13·2	12·8	12·2	10·4	10·6	63·0	,, 17	...	...	...	13·8	14·0	74·0
,, 18	11·4	11·6	11·1	10·8	11·0	55·0	,, 18	13·6	13·2	12·8	12·8	13·0	64·0
,, 19	12·2	12·0	12·8	11·1	11·3	64·0	,, 19	14·2	14·0	12·8	13·8	14·0	57·0
,, 20	12·8	12·6	12·0	11·0	11·2	57·0	,, 20	14·8	14·2	16·2	14·0	14·2	71·0
,, 21	11·2	11·2	9·6	11·1	11·3	70·0	,, 21	14·8	14·2	13·2	14·2	14·4	75·0
,, 22	...	...	...	10·3	10·8	60·0	,, 22	15·6	15·4	15·0	14·6	14·8	84.0
,, 23	12·3	12·2	12·6	11·1	11·4	74·0	,, 23	16·2	15·8	16·0	15·1	15·3	78·0
,, 24	12·0	12·2	11·2	11·4	11·6	72·0	,, 24	...	...	...	15·3	15·6	80·0
,, 25	12·0	11·6	12·2	11·0	11·2	56·0	,, 25	16·0	15·0	16·2	15·5	15·6	76·0
,, 26	13·0	12·2	14·6	11·1	11·2	63·0	,, 26	16·0	15·4	15·6	15·8	16·2	78·0
,, 27	13·6	12·6	14·0	12·0	12·2	73·0	,, 27	16·0	15·8	16·2	15·4	15·8	74·0
,, 28	11·1	11·0	12·8	12·5	12·6	75·0	,, 28	16·4	15·9	16·6	15·2	15·4	71·0
,, 29	...	...	...	12·2	12·4	70·0	,, 29	16·4	15·8	18·8	15·4	15·6	74·0
,, 30	12·0	11·4	13·4	11·6	11·8	64·0	,, 30	15·8	15·4	14·4	16·0	16·2	62·0
,, 31	13·2	12·0	13·8	12·1	12·3	70·0	,, 31	...	...	...	16·1	16·3	66·0
June 1	14·4	12·6	13·7	12·0	12·2	68·0	Aug. 1	16·2	16·0	17·2	15·8	16·0	65·0
,, 2	14·3	12·8	13·2	11·6	12·0	66·0	,, 2	17·0	16·6	20·0	16·0	16·2	72·0
,, 3	10·9	11·4	9·4	11·8	12·0	67·0	,, 3	16·6	16·2	14·0	15·8	16·0	70·0
,, 4	13·0	12·4	13·0	12·2	12·4	75·0	,, 4	16·6	16·2	14·0	15·8	16·0	70·0
,, 5	...	...	...	12·0	12·2	70·0	,, 5	16·1	16·0	15·0	16·0	16·2	70·0
,, 6	14·4	12·8	18·0	13·0	13·2	75·0	,, 6	14·4	14·2	14·6	16·0	16·2	71·0
,, 7	16·0	13·2	19·2	13·6	13·8	82·0	,, 7	...	...	...	15·2	15·4	75·0
,, 8	16·0	12·4	21·4	13·8	14·0	80·0	,, 8	15·0	15·0	13·8	15·4	15·6	57·0
,, 9	13·0	13·7	21·4	14·6	14·8	83·0	,, 9	16·0	15·6	15·6	15·2	15·4	66·0
,, 10	12·6	12·0	11·4	15·0	15·2	84·0	,, 10	15·6	15·3	14·2	15·2	15·4	70·0
,, 11	11·0	10·6	8·2	11·8	12·0	54.0	,, 11	15·8	15·7	14·6	15·2	15·4	70·0
,, 12	...	...	...	12·2	12·4	70·0	,, 12	15·4	15·6	14·8	15·0	15·2	70·0
,, 13	11·6	11·2	12·8	11·8	12·0	72·0	,, 13	15·2	15·6	16·0	14·8	15·0	67·0
,, 14	12·2	11·6	13·4	12·2	12·4	73·0	,, 14	...	...	...	14·6	14·8	64·0
,, 15	12·2	11·5	12·2	12·4	12·6	69·0	,, 15	14·4	15·0	16·2	14·4	14·6	70·0
,, 16	12·3	11·8	11·2	12·4	12·6	74·0	,, 16	14·9	15·2	14·0	14·6	14·8	74·0
,, 17	13·0	12·8	11·8	11·8	12·0	68·0	,, 17	16·6	15·6	16·0	14·4	14·6	69·0
,, 18	12·4	12·2	10·6	12·1	12·3	74·0	,, 18	16·0	15·4	14·6	14·2	14·4	60·0
,, 19	...	...	...	12·6	12·8	72·0	,, 19	15·4	14·8	15·1	14·4	14·6	70·0
,, 20	13·2	12·2	15·2	13·0	13·2	66·0	,, 20	15·4	15·4	15·0	14·3	14·4	72·0
,, 21	14·2	12·8	16·8	13·6	13·8	68·0	,, 21	...	...	...	14·4	14·6	66·0
,, 22	14·9	13·4	16·2	13·6	13·8	72·0	,, 22	15·7	15·6	15·8	14·6	14·8	67·0
,, 23	16·0	14·6	16·4	14·0	14·2	79·0	,, 23	17·0	16·2	19·8	14·6	14·8	68·0
,, 24	16·2	15·8	16·2	14·2	14·4	75·0	,, 24	16·0	15·4	15·4	14·6	14·8	65·0
,, 25	16·0	15·8	12·0	14·0	14·2	64·0	,, 25	15·3	15·2	16·4	14·4	14·6	74·0
,, 26	...	...	...	14·0	14·2	65·0	,, 26	15·2	15·4	14·0	14·4	14·5	70·0
,, 27	14·4	14·0	12·8	14·6	14·8	79·0	,, 27	13·5	13·8	14·0	14·3	14·5	70·0
,, 28	16·0	15·0	15·0	15·1	15·3	81·0	,, 28	...	...	...	14·5	14·6	68·0
,, 29	15·4	14·8	16·0	14·8	15·0	71·0	,, 29	14·0	14·6	11·0	14·3	14·4	60·0
,, 30	15·0	14·9	13·3	15·1	15·3	79·0	,, 30	13·9	14·0	13·4	14·0	14·1	66·0
							,, 31	14·0	13·8	13·2	14·0	14·1	69·0

TABLE IX.—TEMPERATURE OF WATER—*continued.*

Daily Records.

Date.	West Loch. Tarbert—3 p.m.			Loch Ryan. Stranraer—9 a.m.			Date.	West Loch. Tarbert—3 p.m.			Loch Ryan. Stranraer—9 a.m.		
	Surf.	Bot.	Air.	Surf.	Bot.	Air.		Surf.	Bot.	Air.	Surf.	Bot.	Air.
1892.							1892.						
Sept. 1	13·0	13·2	13·2	13·6	13·8	60·0	Nov. 1	7.6	8·0	9·4	6·8	7·0	44·0
,, 2	12·6	12·8	11·0	13·4	13·6	66·0	,, 2	6·8	7·2	8·0	6·6	6·8	47·0
,, 3	12·7	13·0	12·6	12·0	12·2	64·0	,, 3	7·0	7·2	10·2	6·8	7·0	50·0
,, 4	...	...	...	12·0	12·1	60·0	,, 4	8·0	7·8	11·2	7·6	7·8	50·3
,, 5	13·0	13·2	12·6	11·8	12·0	63·0	,, 5	8·9	8·8	8·8	7·8	8·0	54·0
,, 6	13·8	14·1	16·6	12·4	12·6	66·0	,, 6	...	...	...	8·0	8·2	48·0
,, 7	13·5	13·4	10·6	12·0	12·2	60·0	,, 7	7·8	8·0	8·0	7·8	8·0	46·0
,, 8	13·8	13·4	14·6	12·0	12·2	63·0	,, 8	8·2	8·0	9·4	7·6	7·8	45·0
,, 9	14·0	13·5	13·8	12·0	12·2	66·0	,, 9	9·0	8·2	9·4	7·4	7·6	45·0
,, 10	14·1	13·7	14·4	12·0	12·2	66·0	,, 10	9·0	8·2	8·4	7·8	8·0	47·0
,, 11	...	...	...	12·0	12·2	59·0	,, 11	8·2	8·0	10·0	8·2	8·4	53·0
,, 12	13·8	13·6	14·4	12·0	12·2	64·0	,, 12	8·8	8·6	10·4	8·4	8·6	49·0
,, 13	13·8	13·4	12·2	12·2	12·4	66·0	,, 13	...	...	...	8·2	8·4	49·0
,, 14	12·8	13·0	11·8	12·4	12·6	64·0	,, 14	8·6	8·8	8·4	8·2	8·4	48·0
,, 15	12·6	13·0	13·1	12·6	12·8	65·0	,, 15	9·1	9·0	8·0	8·2	8·4	50·0
,, 16	12·4	12·5	10·0	12·4	12·6	64·0	,, 16	9·0	9·2	7·8	8·2	8·6	47·0
,, 17	11·9	12·1	12·2	12·0	12·2	64·0	,, 17	8·6	8·8	8·2	8·0	8·2	45·0
,, 18	...	...	...	12·0	12·1	58·0	,, 18	7·8	8·0	7·0	7·8	8·0	46·0
,, 19	12·4	12·6	12·0	12·2	12·3	61·0	,, 19	8·8	8·6	7·0	7·6	7·8	46·0
,, 20	12·3	12·2	11·3	12·1	12·2	62·0	,, 20	...	...	...	7·8	8·0	46·0
,, 21	12·6	12·8	15·4	11·4	11·6	57·0	,, 21	8·6	8·8	7·2	7·4	7·8	46·0
,, 22	12·0	12·2	11·0	11·2	11·4	55·0	,, 22	7·9	8·0	6·0	7·0	7·2	45·0
,, 23	11·8	12·0	12·2	11·6	11·8	54·0	,, 23	7·2	7·2	5·4	6·2	6·4	44·0
,, 24	11·7	12·0	11·1	11·4	11·6	58·0	,, 24	7·2	7·6	5·4	6·4	6·6	44·0
,, 25	...	...	...	11·2	11·4	56·0	,, 25	7·0	7·2	5·6	6·2	6·4	44·0
,, 26	10·8	11·3	11·0	11·2	11·4	57·0	,, 26	6·8	7·0	7·4	6·4	6·6	47·0
,, 27	11·0	11·2	10·0	11·4	11·6	57·0	,, 27	...	...	...	6·8	7·0	48·0
,, 28	10·0	10·4	8·4	11·2	11·4	56·0	,, 28	8·2	8·0	9·6	7·0	7·2	49·0
,, 29	10·0	10·4	9·6	10·2	10·4	58·0	,, 29	7·4	7·2	6·4	6·8	7·0	46·0
,, 30	10·1	10·2	9·4	10·2	10·3	56·0	,, 30	6·0	6.8	4·0	4·8	5·0	43·0
Oct. 1	11·0	10·7	9·6	10·1	10·2	51·0	Dec. 1	6·6	6·8	3·2	5·3	5·6	44·0
,, 2	...	...	...	10·0	10·2	51·0	,, 2	5·4	5·8	0·2	5·0	5·2	37·0
,, 3	10·4	11·0	9·2	9·4	9·6	50·0	,, 3	5·0	5·4	3·4	5·0	5·2	43·0
,, 4	11·4	11·2	12·5	9·2	9·3	54·0	,, 4	...	...	...	2·4	2·6	36·0
,, 5	11·1	11·0	11·2	9·2	9·3	52·0	,, 5	5·2	5·6	1·4	2·0	2·2	37·0
,, 6	10·9	11·0	10·2	9·2	9·4	55·0	,, 6	5·0	5·4	4·8	2·2	2·4	40·0
,, 7	10·4	10·4	8·8	9·0	9·2	51·0	,, 7	4·9	5·2	2·0	3·0	3·2	40·0
,, 8	9·9	10·0	8·8	8·4	9·0	51·0	,, 8	4·6	5·5	3·5	2·8	3·0	39·0
,, 9	...	...	...	8·0	8·2	50·0	,, 9	4·4	4·8	1·2	2·8	3·0	40·0
,, 10	9·8	10·0	9·9	7·8	8·0	53·0	,, 10	4·8	5·0	4·8	3·4	3·6	39·0
,, 11	10·0	10·1	10·2	7.8	8·0	51·0	,, 11	...	...	...	3·4	3·8	40·0
,, 12	10·0	10·2	9·2	7·8	8·0	52·0	,, 12	4·0	5·0	4·9	3·6	3·8	41·0
,, 13	9·9	10·0	9·2	7·8	7·9	50·0	,, 13	3·8	4·1	2·8	3·6	3·8	40·0
,, 14	10·1	10·4	9·2	7·8	8·0	51·0	,, 14	5·6	5·2	7·8	4·0	4·2	40·0
,, 15	9·9	10·0	8·0	7·8	8·1	51·0	,, 15	5·6	5·0	7·0	4·4	4·6	41·0
,, 16	...	...	...	7·4	7·6	49·0	,, 16	5·4	5·2	8·0	4·6	4·8	45·0
,, 17	8·8	9·0	7·0	6·8	7·0	45·0	,, 17	5·5	5·3	10·0	5·0	5·2	48·0
,, 18	8·2	8·4	8·1	6·3	6·6	46·0	,, 18	...	...	...	5·8	6·0	50·0
,, 19	7·6	7·8	9·2	6·2	6·4	50·0	,, 19	7·0	6·8	8·8	5·8	6·0	49·0
,, 20	8·6	8·8	9·1	6·2	6·4	49·0	,, 20	6·3	6·4	5·0	5·8	6·0	46·0
,, 21	8·2	8·2	7·0	6·6	6·8	47·0	,, 21	7·1	7·0	6·6	5·8	6·0	46·0
,, 22	6·0	6·2	4·4	6·4	6·6	50·0	,, 22	6·9	7·0	6·0	5·4	5·6	44·0
,, 23	...	...	...	4·8	5·0	41·0	,, 23	6·0	6·2	3·2	5·4	5·6	43·0
,, 24	6·4	7·0	5·6	4·6	4·8	45·0	,, 24	5·6	5·8	1·0	3·8	4·0	37·0
,, 25	6·0	6·6	4·8	4·8	5·0	40·0	,, 25	...	...	...	3·6	3·8	35·0
,, 26	6·3	6·5	5·2	4·6	4·8	39·0	,, 26	5·1	5·2	0·2	2·2	2·8	31·0
,, 27	6·0	6·2	11·4	6·2	6·4	48·0	,, 27	4·2	4·2	0·8	2·8	3·0	31·0
,, 28	8·1	7·2	12·4	6·6	7·0	54·0	,, 28	4·0	4·2	4·0	3·0	3·2	35·0
,, 29	9·8	8·4	10·4	7·2	7·4	53·0	,, 29	3·4	3·6	4·8	4·0	4·2	41·0
,, 30	...	...	...	7·0	7·2	49·0	,, 30	3·8	3·9	3·0	3·2	3·4	36·0
,, 31	7·4	7·8	8·1	6·4	6·8	45·0	,, 31	3·2	3·4	2·2	3·0	3·2	37·0

TABLE X.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT OXCAR LIGHTHOUSE.

Ten-day Periods.

Period.	9 A.M.		3 P.M.		Period.	9 A.M.		3 P.M.	
	Surface.		Surface.			Surface.		Surface.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.		Sp. Gr.	Sal.	Sp. Gr.	Sal.
1892.					1892.				
Jan. 1–10	24·3	3·05	24·4	3·07	July 1–10	24·6	3·10	24·6	3·10
,, 11–20	24·2	3·03	24·5	3·08	,, 11–20	24·7	3·12	24·7	3·12
,, 21–31	24·0	3·00	24·2	3·03	,, 21–31	24·8	3·14	24·9	3·16
Feb. 1–10	24·4	3·07	24·3	3·05	Aug. 1–10	25·3	3·23	25·3	3·23
,, 11–20	24·5	3·08	24·8	3·14	,, 11–20	25·0	3·18	24·9	3·16
,, 21–29	23·9	2·99	23·8	2·97	,, 21–31	24·7	3·12	23·6	2·94
Mar. 1–10	23·8	2·97	23·8	2·97	Sept. 1–10	23·9	2·99	24·6	3·10
,, 11–20	24·2	3·03	24·2	3·03	,, 11–20	24·9	3·16	25·0	3·18
,, 21–31	23·9	2·99	23·6	2·94	,, 21–30	24·4	3·07	24·5	3·08
Apr. 1–10	24·4	3·07	24·5	3·08	Oct. 1–10	22·5	2·74	23·3	2·87
,, 11–20	24·3	3·05	24·4	3·07	,, 11–20	23·4	2·89	23·5	2·92
,, 21–30	25·0	3·18	25·1	3·20	,, 21–31	23·7	2·96	23·9	2·99
May 1–10	25·1	3·20	25·2	3·21	Nov. 1–10	23·3	2·87	23·2	2·84
,, 11–20	25·3	3·23	25·3	3·23	,, 11–20	22·3	2·70	22·8	2·78
,, 21–30	24·5	3·08	24·6	3·10	,, 21–30	23·5	2 92	23·5	2·92
June 1–10	24·2	3·03	24·2	3·03	Dec. 1–10	23·2	2·84	23·3	2·87
,, 11–20	24·6	3·10	24·6	3·10	,, 11–20	23·2	2·84	23·2	2·84
,, 21–30	24·6	3·10	24·7	3·12	,, 21–31	23·1	2·82	23·3	2·87

TABLE XI.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT OXCAR LIGHTHOUSE.

Monthly Mean.

Month.	9 A.M.		3 P.M.	
	Surface.		Surface.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1892.				
January	24·2	3·03	24·4	3·07
February	24·3	3·05	24·3	3·05
March	24·0	3·00	23·9	2·99
April	24·6	3·10	24·7	3·12
May	25·0	3·18	25·0	3·18
June	24·5	3·08	24·5	3·08
July	24·7	3·12	24·7	3·12
August	25·0	3·18	24·6	3·10
September	24·4	3·07	24·7	3·12
October	23·2	2·84	23·6	2·94
November	23·0	2·80	23·2	2·84
December	23·2	2·84	23·3	2·87
Mean	24·2	3·03	24·2	3·03

TABLE XII.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT NORTH CARR ROCK LIGHT VESSEL.

Ten-day Periods.

Period.	9 A.M.				3 P.M.			
	Surface.		Bottom.		Surface.		Bottom.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1892.								
Jan. 1–10	24·9	3·16	25·0	3·18	25·0	3·18	25·2	3·21
,, 11–20	25·0	3·18	25·0	3·18	25·1	3·20	25·0	3·18
,, 21–31	25·2	3·21	25·2	3·21	25·0	3·18	25·3	3·23
Feb. 1–10	24·2	3·03	24·4	3·07	23·9	2·99	24·4	3·07
,, 11–20	24·2	3·03	24·3	3·05	24·2	3·03	24·3	3·05
,, 21–29	24·4	3·07	24·5	3·08	24·3	3·05	24·5	3·08
Mar. 1–10*	24·7*	3·12*	24·7*	3·12*	24·8*	3·14*	24·7†	3·12†
,, 11–20	25·6	3·27	25·6	3·27	25·7	3·29	26·0	3·34
,, 21–31	25·5	3·26	25·5	3·26	25·7	3·29	25·9	3·32
Apr. 1–10	25·1	3·20	25·3	3·23	25·1	3·20	25·2	3·21
,, 11–20	25·2	3·21	25·2	3·21	25·3	3·23	25·3	3·23
,, 21–30	25·3	3·23	25·3	3·23	25·3	3·23	25·3	3·23
May 1–10	25·5	3·26	25·6	3·27	25·5	3·26	25·6	3·27
,, 11–20	25·7	3·29	25·7	3·29	26·1	3·36	26·4	3·42
,, 21–31	25·8	3·30	26·1	3·36	26·4	3·42	26·6	3·46
June 1–10	25·6	3·27	25·8	3·30	25·4	3·24	25·8	3·30
,, 11–20	25·4	3·24	25·5	3·26	25·4	3·24	25·6	3·27
,, 21–30	25·4	3·24	25·5	3·26	25·4	3·24	25·6	3·27
July 1–10	26·1	3·36	26·5	3·44	26·6	3·46	26·9	3·52
,, 11–20	25·8	3·30	25·8	3·30	26·2	3·38	26·2	3·38
,, 21–31	26·0	3·34	26·2	3·38	26·2	3·38	26·5	3·44
Aug. 1–10	25·7	3·29	25·8	3·30	25·7	3·29	25·7	3·29
,, 11–20	25·8	3·30	25·9	3·32	25·9	3·32	26·1	3·36
,, 21–31	26·0	3·34	26·1	3·36	26·0	3·34	26·1	3·36
Sept. 1–10	26·1	3·36	26·4	3·42	26·6	3·46	26·7	3·48
,, 11–20	26·1	3·36	26·3	3·40	26·2	3·38	26·5	3·44
,, 21–30	26·1	3·36	26·0	3·34	26·2	3·38	26·2	3·38
Oct. 1–10	25·5	3·26	25·5	3·26	25·2	3·21	25·3	3·23
,, 11–20	25·5	3·26	25·3	3·23	25·4	3·24	25·4	3·24
,, 21–31	25·4	3·24	25·4	3·24	25·5	3·26	25·6	3·27
Nov. 1–10	25·7	3·29	25·6	3·27	25·7	3·29	25·7	3·29
,, 11–20	25·6	3·27	25·5	3·26	25·5	3·26	25·6	3·27
,, 21–30	25·3	3·23	25·3	3·23	25·3	3·23	25·3	3·23
Dec. 1–10	25·3	3·23	25·3	3·23	25·2	3·21	25·3	3·23
,, 11–20	25·4	3·24	25·5	3·26	25·4	3·24	25·4	3·24
,, 21–31	25·0	3·18	25·1	3·20	25·2	3·21	25·4	3·24

TABLE XIII.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT NORTH CARR ROCK LIGHT VESSEL.

Monthly Means.

Month.	9 A.M.				3 P.M.			
	Surface.		Bottom.		Surface.		Bottom.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1892.								
January	25·0	3·18	25·1	3·20	25·0	3·18	25·2	3·21
February	24·3	3·05	24·4	3·07	24·1	3·02	24·4	3·07
March	25·3	3·23	25·3	3·23	25·4	3·24	25·5	3·26
April	25·2	3·21	25·3	3·23	25·2	3·21	25·3	3·23
May	25·7	3·29	25·8	3·30	26·0	3·34	26·2	3·38
June	25·5	3·26	25·6	3·27	25·4	3·24	25·7	3·29
July	26·0	3·34	26·2	3·38	26·3	3·40	26·5	3·44
August	25·8	3·30	25·9	3·32	25·9	3·32	26·0	3·34
September	26·1	3·36	26·2	3·38	26·3	3·40	26·5	3·44
October	25·5	3·26	25·4	3·24	25·4	3·24	25·4	3·24
November	25·5	3·26	25·5	3·26	25·5	3·26	25·5	3·26
December	25·2	3·21	25·3	3·23	25·3	3·23	25·4	3·24
Mean.	25·4	3·24	25·5	3·26	25·5	3·26	25·6	3·27

* Mean of 5 readings.

† Mean of 4 readings.

TABLE XIV.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT BELL ROCK LIGHTHOUSE.

Ten-day periods.

Period.	9 A.M.		3 P.M.		Period.	9 A.M.		3 P.M.	
	Surface.		Surface.			Surface.		Surface.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.		Sp. Gr.	Sal.	Sp. Gr.	Sal.
1892.					1892.				
Jan. 1–10	26·0†	3·34	25·9*	3·32	July 1–10§	25·6	3·27	25·6	3·27
,, 11–20	25·8‡	3·30	..	..	,, 11–20§	25·5‡	3·26	25·3‡	3·23
,, 21–31	25·6‡	3·27	25·6‡	3·27	,, 21–31§	25·2	3·21	25·2	3·21
Feb. 1–10	25·9	3·32	25·9†	3·32	Aug. 1–10§	25·0‡	3·18	25·3‡	3·23
,, 11–20	25·7‡	3·29	25·8†	3·30	,, 11–20	24·8	3·14	24·9	3·16
,, 21–29	25·9*	3·32	25·7	3·29	,, 21–31	25·8	3·30	25·6‡	3·27
Mar. 1–10	25·7	3·29	25·7	3·29	Sept. 1–10	26·1	3·36	26·0‡	3·34
,, 11–20	25·8‡	3·30	25·8†	3·30	,, 11–20	25·9	3·32	25·9‡	3·32
,, 21–31	25·7	3·29	25·8‡	3·30	,, 21–30	25·8‡	3·30	25·6‡	3·27
Apr. 1–10	25·8	3·30	25·8	3·30	Oct. 1–10	25·7	3·29	25·6‡	3·27
,, 11–20	25·7	3·29	25·8†	3·30	,, 11–20	25·9‡	3·32	25·8†	3·30
,, 21–30	25·7	3·29	25·8‡	3·30	,, 21–31	25·6	3·27	25·6	3·27
May 1–10	25·8‡	3·30	25·9	3·32	Nov. 1–10	25·6	3·27	25·6	3·27
,, 11–20	25·8‡	3·30	25·9	3·32	,, 11–20	25·6	3·27	25·6‡	3·27
,, 21–31	25·9‡	3·32	25·9‡	3·32	,, 21–30	25·6‡	3·27	..	..
June 1–10§	25·5	3·26	25·4‡	3·24	Dec. 1–10	25·8	3·30	25·6†	3·27
,, 11–20§	25·5‡	3·26	25·7†	3·29	,, 11–20	25·4	3·24	..	..
,, 21–30§	25·5‡	3·26	25·5	3·26	,, 21–31	25·7	3·29	25·6	3·27

TABLE XV.—SPECIFIC GRAVITY AND CALCULATED SALINITY AT BELL ROCK LIGHTHOUSE.

Monthly Mean.

Month.	9 A.M.		3 P.M.	
	Surface.		Surface.	
	Sp. Gr.	Sal.	Sp. Gr.	Sal.
1892.				
January	25·8	3·30	25·5	3·26
February	25·9	3·32	25·8	3·30
March	25·7	3·29	25·8	3·30
April	25·7	3·29	25·8	3·30
May	25·8	3·30	25·9	3·32
¶June	25·5	3·26	25·5	3·26
¶July	25·4	3·24	25·4	3·24
¶August	25·2	3·21	25·3	3·23
September	25·9	3·32	25·8	3·30
October	25·7	3·29	25·7	3·29
November	25·6	3·27	25·6	3·27
December	25·6	3·27	25·6	3·27
Mean	25·6	3·27	25·6	3·27

* One Observation. † Mean of not more than 3 observations.

‡ Mean of not more than 6 observations.

§ Spec. Gr. not accurate during June and July and first week of August, as the Hydrometer was damaged.

¶ Sp. Gr. not accurate, as the Hydrometer was damaged.

TABLE XVI.—Specific Gravity and Calculated Salinity at Abertay Light Vessel.

Ten-day periods.

Period.	9 A.M.						3 P.M.					
	Surface.		3 fathoms.		Bottom.		Surface.		3 fathoms.		Bottom.	
	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.
1892.												
Jan. 1–10	25·1	3·20	25·1	3·20	25·1	3·20	21·7	2·58	23·4	2·89	23·9	2·99
,, 11–28	22·1	2·66	22·9	2·79	23·3	2·87	24·5	3·08	24·7	3·12	24·9	3·16
,, 21–31	21·7	2·58	23·1	2·82	23·9	2·99	23·7	2·96	24·8	3·14	25·1	3·20
Feb. 1–10	24·0	3·00	24·6	3·10	24·9	3·16	23·0	2·80	24·0	3·00	24·8	3·14
,, 11–20	21·9	2·62	22·6	3·10	23·5	2·92	25·0	3·18	25·2	3·21	25·3	3·23
,, 21–29	22·0	2·64	22·9	2·79	23·6	2·94	23·5	2·92	24·2	3·03	24·4	3·07
Mar. 1–10	24·5	3·08	24·7	3·12	24·8	3·14	24·2	3·03	24·6	3·10	24·9	3·16
,, 11–20	23·5	2·92	23·9	2·99	24·2	3·03	25·0	3·18	25·1	3·20	25·2	3·21
,, 21–31	23·4	2·89	23·8	2·97	24·0	3·00	23·4	2·89	24·5	3·08	24·7	3·12
Apr. 1–10	24·1	3·02	24·6	3·10	25·1	3·20	24·4	3·07	24·7	3·12	25·0	3·18
,, 11–20	24·0	3·00	24·2	3·03	24·4	3·07	24·9	3·16	25·1	3·20	25·4	3·24
,, 21–30	24·4	3·07	24·6	3·10	24·9	3·16	24·5	3·08	24·8	3·14	25·0	3·18
May 1–10	24·8	3·14	24·9	3·16	25·4	3·24	24·8	3·14	22·4	2·72	25·2	3·21
,, 11–20	24·6	3·10	24·7	3·12	25·0	3·18	24·8	3·14	25·0	3·18	25·3	3·23
,, 21–31	23·9	2·99	24·2	3·03	24·6	3·10	24·8	3·14	24·9	3·16	25·3	3·23
June 1–10	22·9	2·79	23·7	2·96	24·6	3·10	22·3	2·70	23·4	2·89	24·2	3·03
,, 11–20	23·7	2·96	24·2	3·03	24·7	3·12	23·7	2·96	24·5	3·08	25·1	3·20
,, 21–30	23·1	2·82	23·3	2·87	24·2	3·03	24·9	3·16	24·9	3·16	25·2	3·21
July 1–10		Ship	under	going	repairs							
,, 11–20	24·9	3·16	25·1	3·20	25·4	3·24	23·7	2·96	24·3	3·05	24·8	3·14
,, 21–31	23·9	2·99	24·2	3·03	24·7	3·12	25·2	3·21	25·3	3·23	25·7	3·29
Aug. 1–10	24·3	3·05	24·7	3·12	25·2	3·21	24·6	3·10	25·0	3·18	25·5	3·26
,, 11–20	25·0	3·18	25·2	3·21	25·4	3·24	24·8	3·14	24·9	3·16	25·2	3·21
,, 21–31	23·4	2·89	23·7	2·96	24·4	3·07	24·6	3·10	25·3	3·23	25·7	3·29
Sept. 1–10	22·1	2·66	23·3	2·87	24·2	3·03	23·8	2·97	25·1	3·20	25·6	3·27
,, 11–20	22·8	2·78	23·6	2·94	24·3	3·05	24·2	3·03	24·6	3·10	24·9	3·16
,, 21–30	23·4	2·89	23·8	2·97	24·0	3·00	22·8	2·78	24·9	3·16	25·5	3·26
Oct. 1–10	19·9	2·00	22·0	2·64	21·7	2·58	23·9	2·99	24·8	3·14	25·1	3·20
,, 11–20	22·3	2·70	23·4	2·89	24·1	3·02	24·2	3·03	24·9	3·16	25·2	3·21
,, 21–31	24·2	3·03	24·0	3·00	24·4	3·07	23·5	2·92	24·5	3·08	24·9	3·16
Nov. 1–10	21·5	2·54	22·1	2·66	22·8	2·78	24·7	3·12	22·4	2·72	25·1	3·20
,, 11–20	20·3	2·33	21·8	2·60	23·4	2·89	21·8	2·60	23·9	2·99	24·5	3·08
,, 21–30	22·7	2·76	23·3	2·87	23·7	2·96	22·6	2·75	23·6	2·94	24·2	3·03
Dec. 1–10	22·6	2·75	23·1	2·82	24·0	3·00	24·9	3·16	25·0	3·18	25·1	3·20
,, 11–20	22·6	2·75	23·3	2·87	24·0	3·00	23·6	2·94	24·4	3·07	24·6	3·10
,, 21–31	23·8	2·97	24·2	3·03	24·4	3·07	23·9	2·99	24·2	3·03	24·6	3·10

TABLE XVII.—Specific Gravity and Calculated Salinity at Abertay Light Vessel.

Monthly Means.

Month.	9 A.M.						3 P.M.					
	Surface.		3 fathoms.		Bottom.		Surface.		3 fathoms.		Bottom.	
	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.	Sp.Gr.	Sal.
1892.												
January	23·0	2·80	23·7	2·96	24·1	3·02	23·3	2·87	24·3	3·05	24·6	3·10
February	22·6	2·75	23·4	2·89	24·0	3·00	23·8	2·97	24·5	3·08	24·8	3·14
March	23·8	2·97	24·1	3·02	24·3	3·05	24·2	3·03	24·7	3·12	24·9	3·16
April	24·2	3·03	24·5	3·08	24·8	3·14	24·6	3·10	24·9	3·16	25·1	3·20
May	24·4	3·07	24·6	3·10	25·0	3·18	24·8	3·14	24·1	3·02	25·3	3·23
June	23·2	2·84	23·7	2·96	24·5	3·08	23·6	2·94	24·3	3·05	24·8	3·14
July	24·4	3·07	24·6	3·10	25·0	3·18	24·4	3·07	24·8	3·14	25·2	3·21
August	24·2	3·03	24·5	3·08	25·0	3·18	24·7	3·12	25·1	3·20	25·5	3·26
September	22·8	2·78	23·6	2·94	24·2	3·03	23·6	2·94	24·9	3·16	25·3	3·23
October	22·1	2·66	23·1	2·82	23·4	2·89	23·9	2·99	24·7	3·12	25·1	3·20
November	21·5	2·54	22·4	2·72	23·3	2·87	23·0	2·80	23·3	2·87	24·6	3·10
December	23·0	2·80	23·5	2·92	24·1	3·02	24·1	3·02	24·5	3·08	24·8	3·14
Mean	23·3	2·87	23·8	2·97	24·3	3·05	24·0	3·00	24·5	3·08	25·0	3·18

II.—PHYSICAL OBSERVATIONS AT THE GARLAND'S TRAWLING STATIONS, 1892.

Temperatures and Transparencies—(1) Firth of Forth.

STATION I.

Date.		West End.						East End.					
		Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.
1892.													
Jan.	19	10·25 a.m.	29·85	3·3	4·0	4·2	1½	12·33 p.m.	29·87	3·3	4·2	4·8	2
Feb.	18	3·45 p.m.	29·31	1·7	4·4	4·2	2	1·40 p.m.	29·30	1·7	4·6	4·8	2½
Mar.	11	1·42 p.m.	29·69	2·8	3·4	3·4	2½	3·35 p.m.	29·68	2·2	3·5	3·5	3
Apr.	26	5·0 p.m.	29·89	8·9	6·4	5·6	3½	2·55 p.m.	29·82	10·0	6·1	5·4	4
May	17	10·20 a.m.	29·87	9·5	7·3	7·2	3½	12·35 p.m.	29·90	9·3	7·8	7·2	3½
June	10	4·0 p.m.	30·01	10·0	9·7	8·2	2½	2·0 p.m.	30·03	8·9	11·2	7·8	3½
July	23	1·30 p.m.	30·26	17·2	11·9	10·7	2½	11·35 a.m.	30·24	15·2	11·8	14·0	6
Sept.	21	4·35 p.m.	30·26	12·3	11·1	11·4	2½	2·40 p.m.	30·24	14·5	11·2	11·4	4
Oct.	21	2·55 p.m.	29·62	7·8	8·9	9·3	2½	4·35 p.m.	29·62	7·8	9·0	9·3	3
Nov.	23	4·10 p.m.	30·26	5·6	7·5	8·5	..	2·0 p.m.	30·23	7·8	7·6	8·9	3
Dec.	16	12·55 p.m.	29·98	8·9	6·0	6·4	3¼	11·0 a.m.	30·03	6·7	5·9	6·5	3½

STATION II.

Jan.	19	3·0 p.m.	29·88	3·9	4·5	4·9	1½	1·23 p.m.	29·87	3·9	4·8	4·8	2
Feb.	18	1·15 p.m.	29·31	1·7	4·4	4·2	3	11·45 a.m.	29·29	0·6	4·4	4·3	3
Mar.	10	3·40 p.m.	29·55	3·3	3·3	3·7	3	2·10 p.m.	29·48	2·8	3·7	3·8	3
Apr.	21	1·37 p.m.	29·92	9·5	5·7	5·0	3	3·0 p.m.	29·93	9·5	5·7	5·0	2⅚
May	19	10·50 a.m.	29·80	8·0	7·2	7·4	4	12·30 p.m.	29·84	11·7	7·5	6·9	5½
June	10	1·25 p.m.	30·04	10·0	10·8	8·1	4	11·40 a.m.	30·05	8·9	10·9	7·8	4
July	20	11·0 a.m.	30·12	11·1	10·7	10·6	4	12·45 p.m.	30·12	11·4	10·8	10·5	5
Sept.	21	1·35 p.m.	30·24	13·9	11·7	11·3	4	11·35 a.m.	30·25	10·6	11·3	11·4	4
Oct.	22	12·55 p.m.	29·59	7·2	9·0	9·2	3	11·30 a.m.	29·61	6·1	9·1	9·3	3¾
Nov.	23	12·55 p.m.	30·25	7·2	7·5	8·8	2¾	11·20 a.m.	30·28	7·2	7·5	8·1	3½
Dec.	22	4·5 p.m.	30·01	5·3	5·7	6·0	4	2·20 p.m.	30·00	5·9	5·9	6·3	5

STATION III.

Jan.	15	4·37 p.m.	29·46	1·6	4·5	5·0	2	2·57 p.m.	29·46	3·9	3·7	4·8	2
Feb.	23	1·35 p.m.	29·75	6·7	4·2	3·5	2	4·0 p.m.	29·74	6·7	3·7	3·8	2
Mar.	11	1·25 p.m.	29·69	3·3	3·3	3·7	2½	11·17	29·68	2·2	3·3	3·7	2½
Apr.	25	4·45 p.m.	29·77	7·2	6·1	5·4	4	2·0 p.m.	29·75	8·9	6·3	5·4	3½
May	20	4·35 p.m.	29·80	8·3	7·8	6·7	5	2·23 p.m.	29·72	10·0	8·6	8·1	3½
June	13	9·5 a.m.	30·11	8·5	9·4	9·5	2½	11·15 a.m.	30·13	10·6	9·5	9·6	3
July	25	9·23 a.m.	30·30	11·4	11·6	11·0	2½	11·40 a.m.	30·28	12·8	12·2	11·5	2½
Sept.	22	1·30 p.m.	30·30	12·2	11·3	11·3	3	11·12 a.m.	30·31	11·7	11·1	11·3	3½
Oct.	21	2·10 p.m.	29·62	7·8	8·9	9·3	3	11·35 a.m.	29·65	9·2	8·6	8·6	2
Nov.	22	4·45 p.m.	30·36	8·0	7·8	9·0	2½	2·45 p.m.	30·34	7·8	7·8	8·2	2
Dec.	16	1·10 p.m.	29·97	8·3	6·2	6·5	2¾	3·30 p.m.	29·92	8·3	5·1	6·3	2¾

STATION IV.

Jan.	22	10·27 a.m.	29·64	3·3	3·5	3·5	1½	12·35 p.m.	29·67	4·5	3·6	3·5	1½
Feb.	23	10·30 a.m.	29·72	7·0	3·0	3·0	1½	1·0 p.m.	29·74	6·1	3·8	3·1	2
Mar.	12	1·0 p.m.	29·54	2·2	2·9	2·8	1½	11·0 a.m.	29·59	3·1	2·9	2·9	1½
Apr.	25	10·30 a.m.	29·77	8·9	5·8	6·2	2½	1·35 p.m.	29·76	8·9	6·8	6·1	3
May	21	10·15 a.m.	29·86	8·3	8·6	8·5	2½	12·15 p.m.	29·81	10·5	8·6	8·5	3
June	14	4·50 p.m.	30·09	16·1	10·2	10·0	2	2·35 p.m.	30·12	15·6	10·0	9·6	3
July	25	3·0 p.m.	30·27	18·3	12·6	12·2	3	12·25 p.m.	30·25	12·8	12·8	12·2	1¾
Sept.	20	3·45 p.m.	30·14	11·7	11·2	11·4	1½	12·40 p.m.	30·11	11·1	11·3	11·5	2
Oct.	26	3·35 p.m.	29·92	7·2	7·4	7·8	2	12·50 p.m.	29·96	6·7	7·2	7·8	2
Nov.	22	11·10 a.m.	30·38	8·3	7·4	8·0	1½	2·15 p.m.	30·34	7·8	7·8	8·2	2
Dec.	23	4·10 p.m.	30·06	3·8	5·7	6·0	2	1·35 p.m.	30·08	5·0	5·7	5·9	3

PHYSICAL OBSERVATIONS—*continued.*

STATION V.

Date.	West End.						East End.					
	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.	Bar.	Air.	Surf.	Bot.	Trans
1892.												
Jan. 21	2·50 p.m.	...	2·8	5·2	5·1		1·15 p.m.	...	3·3	5·4	5·1	...
Feb. 24	12·15 p.m.	29·78	6·1	4·3	4·0	2	2·20 p.m.	29·78	5·6	4·5	4·1	3½
Mar. 16	4·30 p.m.	29·75	5·0	3·9	4·0	3¼	2·15 p.m.	29·77	4·2	3·9	3·9	3½
May 2	10·25 a.m.	29·96	9·5	6·7	5·6	5	12·35 p.m.	29·97	9·5	6·6	5·5	5½
,, 18	10·27 a.m.	29·83	7·2	7·2	6·3	5½	12·50 p.m.	29·73	7·4	7·2	6·1	5½
June 13	4·5 p.m.	30·13	12·2	9·0	7·6	3	1·35 p.m.	30·12	11·1	8·9	10·0	3
July 22	12·5 p.m.	30·18	15·6	11·8	9·5	7	2·30 p.m.	30·20	15·0	11·1	9·7	7
Sept. 14	8·10 a.m.	29·90	11·5	11·4	11·6	7	6·10 a.m.	29·90	10·6	11·4	11·4	7
Oct. 24	2·50 p.m.	29·79	7·8	9·0	9·6	3½	12·55 p.m.	29·77	7·8	9·0	9·6	3½
Nov. 24	2·20 p.m.	30·11	5·0	7·9	8·6	5	2·25 p.m.	30·13	5·0	8·2	8·4	5
Dec. 19	3·5 p.m.	29·95	6·1	6·4	6·9	5	1·0 p.m.	29·94	5·0	6·7	7·0	5

STATION VI.

Date.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.	Bar.	Air.	Surf.	Bot.	Trans
Jan. 23	12 noon.	29·77	5·6	4·9	5·0	3	1·0 p.m.	29·77	5·6	5·0	4·9	3
Feb. 24	4·0 p.m.	29·79	6·1	4·2	4·1	1¾	3·12 p.m.	29·79	5·7	4·0	4·1	1¾
Mar. 16	1·20 p.m.	29·77	5·0	3·8	3·8	3	12·30 p.m.	29·78	4·5	3·9	3·8	3
April 26	1·25 p.m.	29·83	7·8	5·6	5·3	4¾	12·30 p.m.	29·83	7·5	6·2	5·5	5
May 20	10·35 a.m.	29·58	8·9	7·2	6·7	7	11·35 a.m.	29·59	9·2	7·2	6·6	7
June 15	5·30 p.m.	29·86	12·5	9·8	8·9	5	4·30 p.m.	29·88	12·8	9·8	8·6	5
July 20	1·50 p.m.	30·13	11·4	11·0	10·6	5	3·0 p.m.	30·15	12·0	11·1	10·6	5½
Sept. 14	8·55 a.m.	29·91	10·6	11·4	11·7	4½	9·50 a.m.	29·91	12·2	11·4	11·6	6
Oct. 24	10·40 a.m.	29·77	5·9	8·8	9·1	3½	11·45 a.m.	29·77	6·1	9·0	9·5	2½
Nov. 24	3·45 p.m.	30·11	4·5	8·0	8·3	5	2·50 p.m.	30·11	5·0	7·9	8·3	5
Dec. 22	1·15 p.m.	30·00	6·1	6·2	6·7	4	12·35 p.m.	30·00	6·7	6·3	6·5	4½

STATION VII.

Date.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.	Bar.	Air.	Surf.	Bot.	Trans
Jan 15	1·55 p.m.	29·49	5·0	4·2	4·3	3	12·20 p.m.	29·46	3·8	5·0	5·0	4
Feb. 26	2·20 p.m.	30·06	5·0	4·4	4·1	1½	12·20 p.m.	30·05	6·1	4·4	4·1	2
Mar. 14	2·30 p.m.	29·41	3·9	3·3	3·2	2	12·30 p.m.	29·42	2·8	3·4	3·4	2¼
May 2	3·50 p.m.	29·99	11·1	7·2	6·5	3	2·5 p.m.	29·97	10·0	7·1	6·1	3½
,, 18	3·35 p.m.	29·70	9·5	8·3	7·2	4½	2·0 p.m.	29·71	9·8	7·9	7·2	5
June 15	2·15 p.m	29·91	16·1	10·3	9·9	4½	12·20 p.m.	29·98	15·9	9·9	9·0	5
July 22	5·25 p.m.	30·19	14·7	11·5	10·7	4½	3·30 p.m.	30·18	13·9	11·6	11·0	5½
Sept. 14	11·20 a.m.	29·91	11·4	11·4	11·7	3½	12·55 p.m.	29·91	13·3	11·4	11·7	4
Oct. 26	12 noon.	29·96	6·1	7·0	8·8	2	9·55 a.m.	29·87	2·8	8·0	9·4	2¾
Nov. 25	12·50 p.m.	30·17	8·3	7·6	8·3	2¾	10·55 a.m.	30·18	6·4	7·8	8·7	3½
Dec. 15	12·35 p.m.	29·74	6·6	4·7	6·2	2¾	2·20 p.m.	29·75	6·7	4·8	5·8	3

STATION VIII.

Date.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.	Bar.	Air.	Surf.	Bot.	Trans
Jan. 14	3·50 p m.	29·33	3·1	6·4	5·6	6	2·20 p.m.	29·36	3·9	5·9	6·0	6¾
Feb. 19	12·20 p.m.	29·45	1·7	5·0	4·4	3	2·20 p.m.	29·45	1·1	4·6	4·2	4
Mar. 15	4·40 p.m.	29·35	3·7	3·7	3·9	3	3·0 p.m,	29·35	4·3	3·9	4·2	3
May 9	1·10 a.m.	30·10	12·8	7·2	6·1	5½	1·0 p.m.	30·11	10·0	7·2	5·6	6
,, 25	2·18 p.m.	29·61	10·3	7·4	6·9	9	12·35 p.m.	29·60	9·5	7·4	6·1	8½
June 9	3·5 p.m.	30·13	18·3	11·8	6·8	6	1·10 p.m.	30·17	16·7	9·3	6·6	9
July 21	11·15 a.m.	30·16	16·1	10·8	9·9	8	1·25 p.m.	30·13	13·3	10·8	9·5	8½
Sept. 13	12·15 p.m.	29·55	13·6	11·5	11·3	4½	2·15 p.m.	29·63	12·8	11·7	11·9	7
Oct. 25	11·10 a.m.	29·88	7·2	8·0	9·4	3	1·10 p.m.	29·87	7·8	8·9	9·8	4¼
Dec. 2	12·50 p.m.	30·06	2·2	6·9	7·9	3½	2·45 p.m.	30·06	1·6	7·5	8·5	5
,, 20	2·35 p.m.	30·04	5·3	6·0	6·7	4½	12·40 p.m.	30·05	5·9	6·0	7·0	5½

Physical Observations—*continued.*

STATION IX.

Date.		West End.						East End.					
		Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.
1892.													
Jan.	14	1·55 p.m.	29·36	3·9	5·9	6·0	7	12·10 p.m.	29·37	3·6	5·9	6·0	7
Feb.	19	5·0 p.m.	29·45	0·9	4·7	4·3	3½	3·15 p.m.	29·44	0·6	4·7	4·8	4½
Mar.	15	2·40 p.m.	29·36	4·4	4·2	4·4	4½	12·55 p.m.	29·37	3·9	4·5	4·5	8
May	6	2·30 p.m.	30·19	7·8	6·4	5·5	6½	4·10 p.m.	30·17	6·1	6·1	5·7	7
,,	25	2·35 p.m.	29·61	9·5	7·4	6·1	8½	4·45 p.m.	29·60	12·0	7·4	6·3	8½
June	9	12·45 p.m.	30·20	17·8	10·5	6·2	8½	10·50 a.m.	30·22	16·1	10·0	6·4	9½
July	21	2·15 p.m.	30·12	12·8	11·3	8·3	9	2·25 p.m.	30·12	12·8	11·4	8·3	9½
Sept.	13	2·55 p.m.	29·65	12·5	11·8	11·7	7	5·5 p.m.	29·75	11·1	11·9	11·2	8
Oct.	25	1·55 p.m.	29·86	5·6	9·3	10·0	5	4·0 p.m.	29·86	6·1	9·3	9·8	6
Dec.	2	3·20 p.m.	30·06	1·7	7·5	8·5	5	5·20 p.m.	30·05	2·5	8·0	8·3	...
,,	20	12 noon.	30·04	5·6	6·3	7·0	6½	9·55 p.m.	30·03	4·9	6·9	7·2	6½

STATION X.

Feb.	5	11·50 a.m.	29·37	5·0	4·0	4·0	½	12·45 p.m.	29·40	6·7	4·2	4·0	½
Mar.	1	12·15 p.m.	30·15	3·6	3·2	2·8	½	11·25 a.m.	30·13	3·9	3·3	3·1	⅔
Apr.	12	3·5 p.m.	29·91	5·0	5·6	7·2	⅔	4·0 p.m.	29·90	5·0	5·5	7·2	½
May	24	1·0 p.m.	29·64	15·0	8·3	8·7	1	2·15 p.m.	29·68	13·1	8·2	8·3	1
June	14	12·15 p.m.	30·17	12·8	10·0	10·3	½	10·55 a.m.	30·18	12·0	10·3	10·3	½
July	26	11·50 a.m.	30·30	17·2	13·9	13·3	¾	11·0 a.m.	30·30	16·1	13·6	12·8	¾
Nov.	26	11·20 a.m.	29·83	6·7	6·7	7·5	¾	12·10 p.m.	29·83	7·2	6·7	7·9	¾
Dec.	24	12·55 p.m.	29·96	1·1	4·5	5·2	⅔	10·56 a.m.	29·98	0·0	5·3	5·6	⅔

TEMPERATURES AND TRANSPARENCIES—(2) ST. ANDREW'S BAY.

STATION I.

Date.	West End.						East End.					
	Hour.	Bar.	Air.	Surf.	Bot.	Trans.	Hour.	Bar.	Air.	Surf.	Bot.	Trans.
1892.												
Feb. 9	2·45 p.m.	30·08	10·0	5·1	5·0	3¼	12·25 p.m.	30·08	9·5	4·8	5·2	3
Mar. 8	11·0 a.m.	29·79	3·3	3·6	3·9	3	1·0 p.m.	29·77	5·6	3·8	3·9	3
Apr. 15	2·35 p.m.	29·71	6·1	6·4	5·5	4	12·45 p.m.	29·72	7·2	5·4	5·3	4
May 13	3·25 p.m.	29·99	12·2	8·6	6·8	3½	1·15 p.m.	30·02	9·5	7·9	6·5	4
June 8	6·50 p.m.	30·26	15·0	10·9	8·8	5	4·35 p.m.	30·25	13·0	10·1	7·7	6
Oct. 7	4·10 p.m.	29·20	8·3	10·0	10·9	2	2·0 p.m.	29·20	8·9	10·4	10·7	4
Nov. 7	4·20 p.m.	30·07	6·7	7·3	8·2	3	2·0 p.m.	30·07	8·3	7·4	9·0	3
Dec. 8	11·25 a.m.	30·08	2·0	4·6	5·5	2½	1·30 p.m.	30·02	2·2	6·1	6·4	3

STATION II.

Feb. 9.	10·15 a.m.	30·07	6·6	4·5	5·0	3	12 noon.	30·08	8·9	4·6	5·1	3
Mar. 8.	10·40 a.m.	29·79	3·3	3·5	3·9	3	9·5 a.m.	29·81	3·1	3·8	4·2	3½
Apr. 15	10·50 a.m.	29·74	7·0	5·9	5·6	4½	12·30 p.m.	29·73	6·4	5·8	5·4	3½
May 13	3·40 p.m.	29·98	11·7	8·4	6·9	3½	5·15 p.m.	29·97	11·1	7·8	6·7	3¼
June 8	6·25 a.m.	30·24	18·3	10·5	8·5	5	8·20 a.m.	30·24	19·3	10·8	7·7	4
Oct. 8	6·40 a.m.	29·32	7·5	9·8	10·7	3	8·10 a.m.	29·36	7·8	10·3	10·9	3
Nov. 8	7·0 a.m.	30·00	8·3	7·5	8·5	3	8·50 a.m.	30·01	8·3	7·7	9·0	3
Dec. 8	3·50 p.m.	29·89	0·9	4·8	5·8	2	2·0 p.m.	29·99	2·4	5·8	6·6	3

STATION III.

Feb. 8	4·5 p.m.	29·87	7·2	4·8	5·0	3	5·30 p.m.	29·91	6·4	4·7	5·0	2
Mar. 8	7·0 a.m.	29·83	0·9	3·4	3·9	2½	8·40 a.m.	29·82	1·4	3·3	3·9	3
Apr. 15	10·40 a.m.	29·74	7·2	6·1	5·5	4½	9·0 a.m.	29·74	3·1	5·4	5·1	4½
May 13	7·45 p.m.	29·93	11·1	8·2	7·2	3	5·45 p.m.	29·95	10·6	7·8	6·7	3½
June 8	11·40 a.m.	30·31	18·2	11·5	8·7	5	1·40 p.m.	30·30	14·2	10·8	7·6	5¼
Oct. 8	9·0 a.m.	29·37	6·1	9·9	10·8	3	10·30 a.m.	29·38	8·6	10·2	10·8	2¾
Nov. 8	12·10 p.m.	29·93	10·0	7·8	8·8	3½	2·0 p.m.	29·92	10·0	7·9	8·9	2¾
Dec. 6	3·35 p.m.	29·75	4·2	5·7	5·9	3½	1·50 p.m.	29·71	4·4	6·3	6·8	3

STATION IV.

Feb. 8	10·0 a.m.	30·07	6·6	4·4	4·8	3	7·45 a.m.	30·05	4·9	4·3	5·0	2
Mar. 7	6·0 p.m.	29·92	2·5	3·4	3·9	1½	3·55 p.m.	29·93	2·8	3·5	3·7	2
Apr. 15	2·50 p.m.	29·70	3·9	6·1	5·6	4	4·55 p.m.	29·73	1·1	5·4	5·2	3
May 12	5·30 p.m.	30·26	9·5	7·9	7·7	3	3·5 p.m.	30·33	8·3	7·3	7·3	3
June 8	10·30 a.m.	30·31	16·5	10·7	9·4	4	8·10 a.m.	30·33	13·6	10·4	7·9	5½
Oct. 11	7·20 a.m.	29·96	6·7	9·5	10·3	3¼	9·25 a.m.	30·00	8·3	9·8	10·4	3
Nov. 9	7·50 a.m.	29·90	10·6	8·5	8·8	2¾	10·40 a.m.	29·88	10·6	8·4	8·9	3¼
Dec. 8	8·20 a.m.	30·13	2·1	5·6	6·1	1	10·55 a.m.	30·09	1·7	4·9	5·8	2¼

STATION V.

Feb. 8	1·20 p.m.	29·79	7·2	4·9	5·2	3	...	29·84	7·2	4·8	5·1	3
Mar. 7	1·20 p.m.	29·98	3·1	3·8	4·2	3	3·5 p.m.	29·97	2·8	4·6	3·5	3
Apr. 15	7·5 a.m.	29·70	1·7	5·1	5·2	3	8·45 a.m.	29·74	3·3	5·2	5·0	5
May 12	12·23 p.m.	30·38	6·7	6·7	6·2	5½	2·20 p.m.	30·35	7·8	7·7	6·6	3½
June 8	4·15 p.m.	30·26	13·7	9·8	7·5	6	2·10 p.m.	30·30	14·5	10·3	7·5	6
Oct. 11	11·50 a.m.	30·05	11·1	10·1	10·7	5	9·55 a.m.	30·00	11·4	9·8	10·5	4
Nov. 8	4·5 p.m.	29·88	9·5	7·8	9·0	3	2·25 p.m.	29·91	9·5	8·0	9·0	3
Dec. 8	10·0 a.m.	29·66	4·5	5·9	7·0	3¾	12·5 p.m.	29·68	5·0	5·4	7·0	2¾

TABLE III.—Specific Gravity and Calculated Salinity Firth of Forth.

STATION I. West End.

Date.	Hour.	Surface.		Bottom.		Depth in fathoms.
		Sp. Gr.	Sal.	Sp. Gr.	Sal.	
1892.						
February 18	3·45 p.m.	25·7	3·29	25·8	3·30	9½
March 11	1·42 p.m.	25·2	3·21	25·2	3·21	15
April 26	5·0 p.m.	25·5	3·26	25·8	3·30	13
May 17	10·20 a.m.	25·7	3·29	25·8	3·30	11½
June 10	4·0 p.m.	24·3	3·05	25·7	3·29	13
July 23	1·30 p.m.	25·8	3·30	25·9	3·32	14½
September 21	4·35 p.m.	25·8	3·30	25·9	3·32	13
October 21	2·55 p.m.	25·2	3·21	25·1	3·20	13
November 23	4·0 p.m.	25·1	3·20	25·6	3·27	16
December 16	12·55 p.m.	25·6	3·27	25·9	3·32	13
STATION I. East End.						
February 18	1·40 p.m.	25·7	3·29	25·9	3·32	16
March 11	3·35 p.m.	25·3	3·23	25·4	3·24	14½
April 26	2·55 p.m.	25·5	3·26	25·8	3·30	18
May 17	12·35 p.m.	25·7	3·29	25·8	3·30	14½
June 10	2·0 p.m.	25·3	3·23	25·9	3·32	18
July 23	11·35 a.m.	26·1	3·36	26·0	3·34	15½
September 21	2·40 p.m.	25·4	3·24	26·0	3·34	18
October 21	4·35 p.m.	25·4	3·24	25·6	3·27	16¾
November 23	2·0 p.m.	25·1	3·20	26·0	3·34	16
December 16	11·0 a.m.	25·6	3·27	25·8	3·30	15
STATION II. West End.						
February 18	1·15 p.m.	25·6	3·27	25·7	3·29	13
March 10	3·40 p.m.	25·3	3·23	25·4	3·24	14
April	...	...	...	...	...	...
May 19	10·50 a.m.	25·7	3·29	25·7	3·29	13½
June 10	1·25 p.m.	25·2	3·21	26·0	3·34	14
July 20	11·0 a.m.	26·0	3·34	26·3	3·40	14
September 21	1·35 p.m.	26·1	3·36	26·1	3·36	13
October 22	1·0 p.m.	25·3	3·23	25·4	3·24	13½
November 23	1·0 p.m.	25·0	3·18	25·8	3·30	13
December 22	4·5 p.m.	25·6	3·27	25·9	3·32	12
STATION III. East End.						
February 23	4·0 p.m.	25·5	3·26	25·8	3·30	11
March 11	11·17 p.m.	25·6	3·27	25·2	3·21	12½
April 25	2·0 p.m.	25·3	3·23	25·6	3·27	14
May 20	2·23 p.m.	25·7	3·29	25·8	3·30	13
June 13	11·15 a.m.	25·5	3·26	25·6	3·27	10¼
July 25	11·40 a.m.	25·7	3·29	25·7	3·29	9½
September 22	11·12 a.m.	25·5	3·26	25·8	3·30	7
October 21	11·35 a.m.	24·8	3·14	25·1	3·20	8½
November 22	2·45 p.m.	25·1	3·20	25·3	3·23	8
December 16	3·30 p.m.	25·6	3·27	25·9	3·32	13

SPECIFIC GRAVITY—*continued.*

STATION IV. West End.

Date.		Hour.	Surface.		Bottom.		Depth in fathoms.
			Sp. Gr.	Sal.	Sp. Gr.	Sal.	
1892.							
February	23	10·30 a.m.	25·2	3·21	25·5	3·26	4½
March	12	1·0 p.m.	24·4	3·07	24·6	3·10	5½
April	25	10·30 a.m.	25·4	3·24	25·3	3·23	5½
May	21	10·15 a.m.	25·4	3·24	25·4	3·24	7
June	14	4·50 p.m.	25·3	3·23	25·6	3·27	6½
July	25	3·0 p.m.	25·7	3·29	25·8	3·30	6
September	20	3·45 p.m.	25·0	3·18	25·3	3·23	5
October	26	3·35 p.m.	24·7	3·12	24·9	3·16	6½
November	22	11·10 a.m.	24·0	3·00	24·1	3·02	4
December	23	4·10 p.m.	25·1	3·20	25·1	3·20	6½

STATION V. West End.

February	24	12·15 p m.	25·8	3·30	25·9	3·32	29
March	16	4·30 p.m.	25·6	3·27	25·6	3·27	28
May	2	10·25 a.m.	25·8	3·30	25·8	3·30	27½
,,	18	10·27 a.m.	25·6	3·27	25·8	3·30	28
June	13	4·5 p.m.	25·9	3·32	26·0	3·34	29
July	22	12·5 p.m.	26·0	3·34	26·1	3·36	30
September	14	8·10 a.m.	26·3	3·40	26·3	3·40	29½
October	24	2·50 p.m.	25·4	3·24	25·7	3·29	30
November	24	2·20 p.m.	25·6	3·27	26·1	3·36	30
December	19	3·5 p.m.	25·8	3·30	25·9	3·32	31

STATION V. East End.

February	24	2·20 p.m.	25·8	3·30	25·9	3·32	27
March	16	2·15 p.m.	25·5	3·26	25·6	3·27	23
May	2	12·35 p.m.	25·8	3·30	26·0	3·34	24
,,	18	12·50 p.m.	25·9	3·32	25·9	3·32	22
June	13	1·35 p.m.	26·0	3·34	26·2	3·38	24
July	22	2·30 p.m.	25·9	3·32	26·1	3·36	24½
September	14	6·10 p.m.	26·1	3·36	26·3	3·40	25
October	24	12·55 p.m.	25·5	3·26	25·9	3·32	23
November	24	12·25 p.m.	25·9	3·32	25·9	3·32	23½
December	19	1·0 p.m.	25·9	3·32	25·8	3·30	23

STATION VI. West End.

February	24	4·0 p.m.	25·5	3·26	25·7	3·29	16
March	16	1·20 p.m.	25·5	3·26	25·5	3·26	14
April	26	1·25 p.m.	26·0	3·34	26·1	3·36	13
May	20	10·35 a.m.	25·8	3·30	25·9	3·32	13
June	15	5·30 p m.	25·9	3·32	26·0	3·34	15
July	20	1·50 p.m.	25·8	3·30	26·1	3·36	12
September	14	8·55 a.m.	26·0	3·34	26·1	3·36	12
October	24	10·40 a.m.	25·4	3·24	25·5	3·26	13
November	24	3·45 p.m.	25·7	3·29	25·8	3·30	14
December	22	1·15 p.m.	25·7	3·29	25·7	3·29	20

STATION VII. East End.

February	26	12·20 p.m.	25·8	3·30	25·8	3·30	19
March	14	12·30 p.m.	25·3	3·23	25·2	3·21	18
May	2	2·5 p.m.	25·5	3·26	25·7	3·29	16
,,	18	2·0 p.m.	25·6	3·27	25·8	3·30	17
June	15	12·20 p.m.	25·9	3·32	26·0	3·34	16
July	22	3·30 p.m.	25·8	3·30	25·8	3·30	19
September	14	12·55 p.m.	26·0	3·34	26·0	3·34	20½
October	26	10·0 a.m.	24·6	3·10	25·6	3·27	17¼
November	25	10·55 a.m.	25·5	3·26	26·0	3·34	16¾
December	15	2·20 p.m.	24·9	3·16	25·6	3·27	17½

Specific Gravity—*continued.*

STATION VIII. N. E. End.

Date.		Hour.		Surface.		Bottom.		Depth in fathoms.
				Sp. Gr.	Sal.	Sp. Gr.	Sal.	
1892.								
February	19	2·20	p.m.	25·9	3·32	26·1	3·36	26½
March	15	3·0	p.m.	25·5	3·26	25·6	3·27	29
May	9	1·0	p.m.	25·8	3·30	25·9	3·32	29
,,	25	12·35	p.m.	25·8	3·30	25·9	3·32	29
June	9	1·10	p.m.	26·2	3·38	26·3	3·40	27½
July	21	1·25	p.m.	26·3	3·40	26·3	3·40	29
September	13	2·15	p.m.	25·8	3·30	26·2	3·38	29
October	25	1·10	p.m.	25·6	3·27	26·0	3·34	28½
December	2	2·45	p.m.	25·8	3·30	26·1	3·36	28½
,,	20	12·40	p.m.	25·5	3·26	26·0	3·34	28

STATION IX. S. E. End.

Date.		Hour.		Surface.		Bottom.		Depth in fathoms.
				Sp. Gr.	Sal.	Sp. Gr.	Sal.	
February	19	3·15	p.m.	25·8	3·30	25·9	3·32	30
March	15	1·0	p.m.	26·0	3·34	26·1	3·36	32
May	6	4·10	p.m.	25·9	3·32	26·2	3·38	33
,,	25	4·45	p.m.	25·9	3·32	26·1	3·36	32
June	9	10·50	a.m.	26·1	3·36	26·1	3·36	33
July	21	2·25	p.m.	26·4	3·42	26·5	3·44	33
September	13	5·5	p.m.	25·9	3·32	26·3	3·40	32
October	25	4·0	p.m.	26·0	3·34	26·2	3·38	33
December	2	5·20	p.m.	25·7	3·29	25·9	3·32	34
,,	20	9·55	p.m.	26·0	3·34	26·1	3·36	34

TABLE IV.—Specific Gravity and Calculated Salinity St. Andrews Bay.

STATION II. East End.

Date.		Hour.		Surface.		Bottom.		Depth in fathoms.
				Sp. Gr.	Sal.	Sp. Gr.	Sal.	
1892.								
March	8	9·5	a.m.	25·6	3·27	26·0	3·34	12½
April	15	12·30	p.m.	25·1	3·20	25·3	3·23	12
May	13	5·15	p.m.	25·5	3·26	25·8	3·30	13
June	9	8·20	a.m.	23·5	2·92	26·2	3·38	13
October	8	8·10	a.m.	25·2	3·21	25·7	3·29	13
November	8	8·50	a.m.	23·5	2·92	25·7	3·29	12
December	8	2·0	p.m.	25·1	3·20	25·6	3·27	13

STATION IV. S. W. End.

Date.		Hour.		Surface Sp. Gr.	Surface Sal.	Bottom Sp. Gr.	Bottom Sal.	Depth in fathoms.
March	7	6·0	p.m.	24·9	3·16	25·4	3·24	7½
April	15	2·50	p.m.	24·8	3·14	25·2	3·21	8
May	12	5·30	p.m.	25·6	3·27	25·8	3·30	7
June	8	10·30	a.m.	24·3	3·05	25·6	3·27	4
October	11	7·20	a.m.	23·1	2·82	24·7	3·12	7
November	9	7·50	a.m.	25·2	3·21	25·5	3·26	6
December	8	10·55	a.m.	24·6	3·10	24·9	3·16	7

STATION V. South End.

Date.		Hour.		Surface Sp. Gr.	Surface Sal.	Bottom Sp. Gr.	Bottom Sal.	Depth in fathoms.
March	7	1·20	p.m.	24·8	3·14	25·6	3·27	16
April	15	7·5	a.m.	25·1	3·20	25·4	3·24	16
May	12	12·23	p.m.	25·8	3·30	25·8	3·30	17
June	8	4·15	p.m.	25·6	3·27	26·0	3·34	15
October	11	11·50	a.m.	25·5	3·26	25·9	3·32	14½
November	8	4·5	p.m.	24·5	3·08	25·7	3·29	18
December	6	10·0	a.m.	25·7	3·29	25·7	3·29	15

STATION V. North End.

Date.		Hour.		Surface Sp. Gr.	Surface Sal.	Bottom Sp. Gr.	Bottom Sal.	Depth in fathoms.
March	8	3·5	p.m.	24·6	3·10	25·8	3·30	13½
April	15	8·45	a.m.	25·3	3·23	25·7	3·29	13
May	12	2·20	p.m.	25·6	3·27	25·9	3·32	15
June	8	2·10	p.m.	25·1	3·20	26·2	3·38	16
October	11	9·55	a.m.	24·9	3·16	25·6	3·27	14½
November	8	2·25	p.m.	24·0	3·00	25·8	3·30	15
December	6	12·5	p.m.	24·7	3·12	25·5	3·26	14

III.—TEMPERATURE OBSERVATIONS ON CRUISERS, 1892.

1. CAMPBELTOWN LOCH.

Date.		9 A.M.						3 P.M.					
		Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1892.													
Mar.	5*	7·6	5·8	5·8	6·0 (9)	.	.	7·5	5·6	5·6	.	5·8	.
,,	24*	6·6	6·0	6·0	.	6·1	.	7·7	6·1	6·0	5·9 (9)	.	.
June	11†	.	.	.	.	.	.	8·8	9·0	8·8	8·9 (9)	.	.
Sept.	14*	.	.	.	.	.	.	12·8	11·7	11·7	.	11·6	.
Oct.	5*	9·4	10·3	10·5	.	10·7	.	.	.	.	.	.	.
Nov.	2*	7·6	9·3	9·3	.	9·3	.	8·4	9·4	9·5	.	9·5	.
,,	21*	8·3	9·1	9·1	.	9·2	.	8·8	9·1	9·1	.	9·1	.
Dec.	8*	5·0	6·7	6·9	.	.	7·1 (9)	.	.	.	.	.	.
,,	15*	.	.	.	.	.	.	7·7	7·8	8·1	8·2 (9)	.	.

† Made at 6 p.m.

2. LAMLASH HARBOUR.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	10 fms.	10–15 fms.	Over 15 fms.	Air.	Surf.	5 fms.	10 fms.	10–15 fms.	Over 15 fms.
1892.												
Sept. 21*	10·1	12·2	12·2	12·1	12·1 (14)	.	12·2	12·2	12·2	12·1	11·9 (15)	.
Oct. 21*	.	.	.	.	.	.	7·7	9·7	10·0	10·1	10·2 (14)	.
Nov. 19*	.	.	.	.	.	.	6·6	9·6	9·6	9·8	9·9 (13)	.
,, 24*	.	.	.	.	.	.	5·4	9·4	9·4	9·5	9·5 (15)	.
Dec. 3*	.	.	.	.	.	.	3·9	8·6	8·7	8·8	8·9 (15)	8·9 (17)

3. ROTHESAY BAY.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	10 fms.	10–15 fms.	Over 15 fms.	Air.	Surf.	5 fms.	10 fms.	10–15 fms.	Over 15 fms.
1892.												
Mar. 16*	2·9	4·6	5·3	6·1	6·1 (12)	.	.	.	.	.	.	.
,, 22*	.	.	.	.	.	.	8·3	6·3	5·8	5·8	5·8 (12)	.
,, 26*	6·9	6·1	6·1	6·1	6·1 (13)	.	.	.	.	.	.	.
,, 28*	2·2	5·2	5·8	5·8	5·8 (12)	.	.	.	.	.	.	.
,, 30*	7·5	5·6	5·7	6·0	6·0 (12)	.	10·1	5·8	5·8	5·9	6·0 (13)	.
,, 31*	7·2	5·8	5·9	6·1	6·1 (12)	.	.	.	.	.	.	.
Apr. 1*	9·1	6·0	5·9	6·1	6·1 (12)	.	.	.	.	.	.	.
,, 5*	7·7	6·6	6·3	6·2	6·1 (13)	.	.	.	.	.	.	.
,, 16*	.	.	.	.	.	.	4·4	6·6	6·3	6·2	6·1 (13)	.
,, 19*	.	.	.	.	.	.	9·9	7·1	6·8	6·3	6·1 (12)	.
,, 21*	10·0	6·6	6·4	6·2	6·2 (12)	.	.	.	.	.	.	.
June 6	13·9	13·3	13·1	13·2†	.	.	15·0	13·9	.	.	.	.
,, 7	15·0	13·7	.	.	.	.	18·9	13·8	.	.	.	.
,, 8	15·3	13·9	.	.	.	.	19·9	14·0	.	.	.	.
,, 9	17·6	13·7		.	.	.	24·0‡	13·8	.	.	.	.
,, 10	12·6	12·8	.	.	.	.	11·3	12·8	.	.	.	.
,, 11	8·3	9·5	.	.	.	.	.	.	.	.	.	.
Sept. 17*	.	.	.	.	.	.	12·4	11·8	11·7	11·7	11·7 (12)	.
,, 19*	14·2	12·0	12·0	11·9	11·9 (13)	.	.	.	.	.	.	.
,, 23*	10·2	11·1	11·1	11·2	11·3 (12)	.	13·0	11·1	11·1	11·3	11·5 (13)	.
,, 30*	.	.	.	.	.	.	7·7	11·1	11·1	11·2	11·6 (14)	.
Oct. 8*	7·3	10·4	10·8	11·3	11·3 (13)	.	.	.	.	.	.	.
,, 14*	10·5	10·2	10·3	10·8	11·1 (13)	.	.	.	.	.	.	.
,, 15*	8·6	10·1	10·2	10·4	11·0 (13)	.	.	.	.	.	.	.
,, 22*	.	.	.	.	.	.	7·0	10·0	10·0	10·0	10·7 (13)	.
,, 29*	10·2	10·3	10·4	10·4	10·5 (14)	.	.	.	.	.	.	.
Nov. 1*	5·6	10·0	10·3	10·3	10·4 (14)	.	.	.	.	.	.	.
,, 5*	11·1	10·0	10·0	10·0	10·1 (14)	.	.	.	.	.	.	.
,, 8*	9·6	9·4	9·7	9·7§	.	.	.	.	.	.	.	.
,, 11*	10·6	9·7	10·0	10·0	10·0 (13)	.	.	.	.	.	.	.
,, 12*	8·6	9·7	9·9	9·9	10·0 (13)	.	.	.	.	.	.	.
,, 19*	6·4	8·5	8·7	9·0	9·1 (12)	.	.	.	.	.	.	.
,, 28*	11·3	9·9	9·9	10·0	10·0 (12)	.	.	.	.	.	.	.
,, 30*	.	.	.	.	.	.	3·2	8·8	9·1	9·5	9·8 (12)	.
Dec. 1*	2·9	8·3	9·0	9·5	9·7 (14)	.	8·4	8·3	8·4	9·3	10·0 (13)	.
,, 3*	5·8	7·1	7·2	8·2	9·6 (14)	.	.	.	.	.	.	.
,, 12*	4·0	7·6	7·7	8·8	8·9 (13)	.	.	.	.	.	.	.
,, 13*	2·2	7·3	7·6	8·3	8·7 (13)	.	.	.	.	.	.	.
,, 14*	8·0	8·0	8·3	8·3	8·3 (13)	.	.	.	.	.	.	.
,, 19*	8·5	8·3	8·4	8·5	8·8 (14)	.	.	.	.	.	.	.
,, 24*	−0·4	6·2	6·7	6·8	6·9 (13)	.	.	.	.	.	.	.
,, 27*	0·7	3·2	4·6	8·3	8·3 (13)	.	.	.	.	.	.	.

† At 8 fathoms. ‡ Highest on Record. § At 6 fathoms.

4. FAIRLIE ROADS.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1892.												
Feb. 26*	5·9	5·0	5·7	5·7 (8)	.	.	7·3	6·1	6·1	6·1 (7)	.	.
Oct. 27*	8·9	9·8	10·0	.	10·0	.	11·6	10·1	10·1	.	10·0	10·0 (11)
Nov. 12*	.	.	.	.	.	.	9·4	9·4	9·4	9·5 (8)	.	.
Dec. 16*	.	.	.	.	.	.	8·7	7·7	7·8	7·9 (8)	.	.
,, 17*	9·0	7·3	7·3	7·4 (9)	.	.	.	.	.	.	.	.

5. OFF GREENOCK

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
Mar. 18*	.	.	.	.	.	.	13·0	6·2	6·1	6·1 (9)	.	.
,, 19*	9·1	6·1	5·4	.	5·4	.	11·3	6·1	6·0	5·8 (9)	.	.
,, 21*	8·1	5·8	6·0	5·8 (9)	.	.	7·5	6·4	6·2	6·1 (9)	.	.
Apr. 22*	.	.	.	.	.	.	5·8	7·5	7·1	.	.	.
,, 23*	9·3	7·2	7·2	7·2 (6)	.	.	8·2	7·1	7·0	.	.	.
,, 25*	8·8	7·5	7·4	7·4 (6)	.	.	.	.	.	.	.	.
Sept. 26*	.	.	.	.	.	.	13·4	11·6	11·6	11·6 (8)	.	.
,, 27*	11·2	11·6	11·6	11·6 (8)	.	.	11·6	11·7	11·6	11·6 (8)	.	.
,, 28*	9·0	11·1	11·3	11·5 (7)	.	.	.	.	.	.	.	.
Nov. 28*	.	.	.	.	.	.	11·0	9·0	9·1	9·3 (9)	.	.
,, 29*	5·0	8·8	8·9	.	9·0	.	5·8	8·9	9·0	9·2 (9)	.	.
Dec. 20*	.	.	.	.	.	.	7·1	7·2	8·0	8·5 (9)	.	.
,, 21*	7·3	7·7	8·1	9·1 (8)	.	.	.	.	.	.	.	.
,, 22*	7·9	7·8	8·5	8·4 (8)	.	.	.	.	.	.	.	.

6. OBAN BAY.

No Observations.

7. CASTLE BAY, BARRA.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	0-5 fms.	5 fms.	5–10 fms.	Over 10 fms	Air.	Surf.	0–5 fms.	5 fms.	5–10 fms.	Over 10 fms.
1892.												
May 14	.	.	.	.	.	.	11·1	7·7	7·8 (4)*	.	.	.
,, 15	11·2	7·8	.	7·8	.	.	11·1	8·6	8·8 (4)	.	.	.
,, 16	9·5	8·6	.	8·3	.	.	11·2	8·8	8·7 (4)	.	.	.
,, 17	9·4	8·4	.	8·5	.	.	13·5	9·1	8·7 (4)	.	.	.
,, 18	8·9	8·5	.	8·5	.	.	11·6	9·4	9·0 (4)	.	.	.
,, 19	11·6	9·3	.	9·0	.	.	12·3	9·2	8·9 (4)	.	.	.
,, 20	8·7	8·9	8·5 (4½)	.	.	.	12·2	8·7	8·5 (4)	.	.	.
,, 21	10·0	8·9	8·9 (4)	.	.	.	8·9	8·6	8·9 (4)	.	.	.
,, 22	7·7	8·7	.	8·9	.	.	7·3	8·9	8·7 (4)	.	.	.
,, 23	10·7	8·9	8·5 (4)	.	.	.	.	.	.	.	.	.
,, 31	.	.	.	.	.	.	12·7	9·9	.	9·5	.	.
June 1	10·6	10·0	.	9·5	.	.	12·2	10·1	9·5 (4¾)	.	.	.
,, 2	10·2	9·4	.	9·1	.	.	9·7	9·4	.	9·0	.	.
,, 3	9·9	9·2	9·1 (4½)	.	.	.	12·6	9·0	9·0 (4)	.	.	.
,, 13	10·0	10·1	.	10·2	10·2 (6½)	.	10·6	10·0	.	10·2	.	.
,, 14	11·7	10·4	.	10·2	10·2 (6)	.	13·9	10·6	.	10·2	.	.
,, 15	10·8	10·6	.	.	10·6 (5½)	.	11·8	10·5	.	10·5	.	.
,, 16	9·4	10·5	.	10·2	10·2 (6)	.	.	10·3	.	10·3	.	.
,, 17	10·1	10·4	.	10·3	.	.	12·3	10·3	10·3 (1)	.	.	.
,, 18	.	.	.	.	.	.	10·5	10·3	.	10·2	.	.

8. VATERSAY BAY.

Date.	9 A.M.						3 P.M.					
May 11*	.	.	.	.	.	.	11·0	9·5	.	9·2	8·3 (9)	.

* Observations taken at 7.30 p.m.

9. STORNOWAY LOCH.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1892.												
May 5*	7·0	7·2	7·0	.	.	.	.	.	.	.	.	.
,, 5*	.	.	.	.	.	.	6·8	7·3	7·2	7·2(6)	.	.
,, 8*	9·9	7·7	7·3	.	.	.	.	.	.	.	.	.
,, 14*	.	.	.	.	.	.	11·3	7·5	7·6	7·2(9)	.	.
,, 16*	9·4	8·3	7·9	.	7·1	.	.	.	.	.	.	.
,, 16*	.	.	.	.	.	.	14·1	8·4	7·7	7·0(9)	.	.
,, 21*†	6·6	7·6	7·3	.	.	.	11·8	7·7	7·6	7·6(6)	.	.
,, 23*	7·9	8·3	7·7	.	.	.	.	.	.	.	.	.
,, 23*	.	.	.	.	.	.	11·1	8·3	7·9	7·7(6)	.	.
,, 28*†	13·1	9·0	8·3	.	8·3	.	12·3	10·1	9·1	8·3(9)	.	.
,, 30*	11·3	9·3	8·8	.	8·7	.	.	.	.	.	.	.
June 3*	.	.	.	.	.	.	10·7	9·6	9·1	8·3(8)	.	.
,, 4*	12·3	8·5	8·5	8·6(7)	.	.	.	.	.	.	.	.
,, 4*†	.	.	.	.	.	.	15·5	9·4	9·0	8·5(8)	.	.
,, 13*†	.	.	.	.	.	.	10·3	10·0	9·9	9·9(6)	.	.
,, 14*	11·2	10·0	10·0	9·9(8)	.	.	12·6	10·1	10·0	10·0(6)	.	.
,, 16*	8·3	10·1	10·0	10·0(7)	.	.	.	.	.	.	.	.
,, 16*	.	.	.	.	.	.	9·7	9·8	9·4	9·4(7)	.	.
,, 17*	11·1	10·0	10·0	9·7(8)	.	.	.	.	.	.	.	.
,, 17*	.	.	.	.	.	.	11·5	10·3	10·3	10·0(8)	.	.
,, 19	.	.	.	.	.	.	11·7	10·1	10·0	10·0(6)	.	.
,, 20	11·7	10·2	10·0	10·0(6)	.	.	12·8	10·8	.	10·0(5½)	.	.
,, 21	12·6	10·8	10·1	10·1(6)	.	.	15·0	11·1	10·4	.	.	.
,, 22	11·5	11·3	10·5	10·5(6)	.	.	13·5	10·6	10·6	.	.	.
,, 23	11·6	10·8	10·6	10·6(6)	.	.	12·9	10·4	10·6	.	.	.
,, 24	10·3	10·2	10·6	10·6(6)	.	.	12·1	10·5	10·4	10·4(6)	.	.
,, 25	11·3	10·6	10·5	.	.	.	11·1	10·5	10·5	.	.	.
,, 26	12·1	10·4	10·5	.	.	.	14·0	10·4	10·5	.	.	.
,, 27	12·6	10·6	10·6	10·6(6)	.	.	13·8	11·1	10·6	10·6(6)	.	.
,, 28	12·7	9·6	8·9	8·9(7½)	.	.	15·6	11·5	8·9	.	.	.
,, 29	13·0	9·3	8·7	8·7(7)	.	.	16·7	10·1	9·3	9·2(6)	.	.
,, 30	13·1	10·0	9·3	9·3(7)	.	.	15·3	9·9	9·3	9·3(6)	.	.
July 1	12·6	10·1	9·4	9·4(7)	.	.	13·7	9·8	9·4	9·4(6)	.	.
,, 2	11·1	9·6	9·0	.	.	.	10·0	9·5	9·4	9·4(6)	.	.
,, 3	10·0	9·4	9·4	.	.	.	12·8	9·5	9·2	.	.	.
,, 4	12·2	10·0	9·3	9·3(6)	.	.	12·8	10·0	9·2	9·2(7)	.	.
,, 5	12·8	10·5	10·2	10·2(7)	.	.	12·2	10·5	10·0	10·0(7)	.	.

† Stornoway Harbour.

10. KIRKWALL BAY.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	0-5 fms.	5 fms.	5–10 fms.	Over 10 fms.	Air.	Surf.	0-5 fms.	5 fms.	5–10 fms.	Over 10 fms.
1892.												
Aug. 18	.	.	.	.	.	.	14·1	12·3	.	12·4	12·4(6)	.
,, 24	12·6	12·2	.	12·3	12·3(7)	.	.	.	.	.	.	.

11. WICK BAY.

July 28	14·9	11·3	10·6(4)	.	.	.	14·9	11·8	.	11·6	.	.
,, 29†	14·9	11·1	11·1(4½)	.	.	.	.	.	.	.	.	.

† Observed at 7.30 a.m.

12. INVERGORDON, CROMARTY FIRTH.

Date.	9 A.M.						3 P.M.					
	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.	Air.	Surf.	5 fms.	5–10 fms.	10 fms.	Over 10 fms.
1892.												
Feb. 20	−3·1	2·6	4·1	.	.	4·5(10½)	−1·9	2·4	4·1	4·5(9)	.	.
,, 21	2·2	2·5	4·0	.	.	4·5(10½)	2·2	2·3	3·9	4·5(9)	.	.
,, 22	2·2	2·8	3·3	.	3·3	3·3(11½)	1·9	3·0	3·3	3·9(9)	.	.
,, 23	0·4	1·3	3·5	.	3·9	3·9(12)	6·8	1·6	3·7	.	4·0	.
July 9	11·7	11·7	11·2	.	10·7	.	15·6	11·8	11·4	.	10·6	10·6(12)
,, 10	13·3	10·7	.	.	.	.	14·5	11·7	.	.	.	.
,, 11	13·3	11·9	11·5	.	10·9	10·9(11)	.	.	.	.	.	.
,, 25	15·6	13·8	13·3	.	12·9	12·9(12)	15·7	13·9	13·3	.	12·9	12·9(13)
,, 26	13·9	13·9	13·5	.	13·2	.	13·5	12·8	12·5	.	12·3	12·3(12)
,, 27	13·4	14·0	13·3	.	13·3	.	13·7	13·5	12·2(4)	.	.	.
,, 29*	.	.	.	.	.	.	12·8	12·2	12·0	.	11·8	.
Aug. 1	12·3	14·3	13·7	.	12·1	12·1(12)	13·3	14·5	13·7	.	12·1	12·1(12½)
Oct. 2	10·1	10·5	10·3	10·0(9)	.	.	11·2	10·6	10·3	.	10·1	10·1(11)
,, 3	9·0	10·4	10·0	10·0(9)	.	.	6·2	10·8	10·5	.	10·2	10·0(11)
,, 4	7·3	10·3	10·0	.	10·0	.	7·9	10·0	10·6	.	10·1	10·3(12)
,, 5	5·7	10·0	10·0	.	10·5	.	9·0	10·2	10·4	.	10·8	10·7(13)
,, 6	8·8	9·7	10·2	.	10·5	10·5(13)	.	.	.	.	.	.
,, 14	7·6	9·6	9·5	.	9·8	9·9(12)	10·1	9·5	9·3	.	9·7	10·0(12)
,, 15	11·0	8·0	9·4	.	9·9	10·0(11)	9·6	8·0	9·3	.	9·9	.
,, 16	4·4	7·8	9·5	.	9·8	10·0(13)	4·7	7·7	9·3	.	9·9	.
,, 17	4·6	7·9	9·4	.	9·8	9·9(13)	5·1	8·0	9·8	.	9·8	.
,, 18	4·8	8·1	9·2	.	9·6	9·7(13)	7·2	8·0	9·7	.	9·7	.
,, 19	5·4	8·0	9·3	.	9·6	9·6(13)	7·8	8·2	9·7	.	9·7	.
,, 20	6·0	8·5	9·2	.	9·6	9·6(12)	7·9	9·9	9·8	.	10·0	10·0(12)
,, 21	4·5	8·5	8·7	.	9·2	9·4(12)	.	.	.	.	.	.
Dec. 15	5·8	5·7	5·9	.	6·1	6·2(15)	.	.	.	.	.	.

* Observed at 7.30 p.m.

10.—TEN DAY AND MONTHLY MEANS OF OBSERVATIONS TAKEN ON BOARD THE CRUISERS 'JACKAL' AND 'VIGILANT' AT ROTHESAY, STORNOWAY, AND INVERGORDON.

CRUISER OBSERVATIONS—ROTHESAY.

Ten day Means.

Period.	9 A.M.			3 P.M.			Period.	9 A.M.			3 P.M.		
	No. of Observations.	Surface.	10 fathoms.	No. of Observations.	Surface.	10 fathoms.		No. of Observations.	Surface.	10 fathoms.	No. of Observations.	Surface.	10 fathoms.
1887.							1890.						
April 20–30	1	7·0	6·5	2	7·8	7·2	Jan. 1–10	2	7·6	8·0	2	7·4	8·1
May 1–10	3	7·9	7·0	3	8·6	7·0	,, 11–20	...	...	...	2	7·1	7·3
,, 11–20	...	...	...	1	9·8	7·2	,, 21–31	2	6·7	7·4	2	7·2	7·7
June 1–10	3	9·2	8·7	3	9·4	7·8	Feb. 1–10	1	7·3	7·4	1	6·0	7·4
Oct. 1–10	5	11·5	12·0	4	11·8	12·1	,, 11–20	2	4·9	7·3	1	5·2	7·4
,, 11–20	4	10·8	10·8	4	10·7	11·3	,, 21–28	1	5·9	7·0	1	6·0	7·0
,, 21–31	8	10·9	10·8	7	10·7	10·6	Mar. 21–31	2	6·8	6·8	2	7·0	6·9
Nov. 1–10	5	9·0	9·2	4	9·3	9·8	Apr. 1–10	1	7·3	7·2	1	7·4	7·2
,, 11–20	7	8·7	9·7	8	8·8	10·0	,, 11–20	1	7·1	7·1	...	...	...
,, 21–30	7	8·8	9·4	5	9·1	9·4	,, 21–30	1	7·9	7·4	...	...	...
Dec. 1–10	5	8·4	9·0	6	8·2	8·9	May 11–20	3	9·1	8·5	...	...	...
,, 11–20	6	6·9	8·4	5	7·1	8·1	Sept. 11–20	1	13·5	12·7	1	13·4	12·7
,, 21–31	8	5·6	8·3	9	5·5	8·3	,, 21–30	3	13·2	12·8	2	13·2	12·7
1888.							Oct. 1–10	3	12·3	12·4	1	12·5	12·3
Jan. 1–10	5	7·7	8·0	5	7·8	8·0	,, 11–20	2	12·6	12·6	...	...	...
,, 11–20	3	6·7	7·4	2	6·6	7·3	,, 21–31	1	11·0	11·5	1	11·2	11·5
,, 21–31	4	6·0	7·3	4	5·9	7·4	Nov. 1–10	1	10·8	11·6	1	10·8	11·2
Feb. 1–10	2	6·8	7·2	3	7·0	7·1	,, 21–30	1	9·6	11·0	...	...	...
,, 11–20	3	5·7	7·0	3	5·6	6·7	Dec. 1–10	1	8·6	10·3	...	...	...
,, 21–29	3	4·7	6·0	3	5·2	5·9	,, 11–20	...	...	...	1	7·8	8·4
Mar. 1–10	6	5·4	6·1	4	5·6	6·3	1891.						
May 1–10	1	6·6	6·3	1	7·3	...	Jan. 1–10	2	8·5	7·8	1	7·8	8·7
,, 11–20	3	7·7	...	3	7·4	6·9	,, 11–20	2	7·1	7·4	...	...	...
Oct. 1–10	7	10·4	10·5	4	10·4	10·5	,, 21–31	1	6·8	7·0	2	8·1	7·0
,, 11–20	5	10·1	10·1	4	10·1	10·2	Feb. 1–10	2	6·2	6·6	...	...	...
,, 21–31	9	10·2	10·1	8	10·2	10·1	,, 11–20	1	4·9	6 7	1	6·5	6·8
Nov. 11–20	5	9·2	9·5	5	9·3	9·5	,, 21–28	1	6·1	6·7	...	...	...
,, 21–30	4	8·9	9·6	4	9·3	9·6	Mar. 11–20	2	5·8	6·4	2	6·0	6·3
Dec. 1–10	5	8·1	9·5	5	8·2	9·4	Apr. 21–30	4	7·1	6·8	2	7·2	6·7
,, 11–20	4	7·3	8·8	3	8·7	9·4	May 1–10	2	7·6	6·5	1	8·5	6·6
,, 21–31	2	7·1	8·3	1	7·8	8·2	Sept. 21–30	2	12·3	12·2	1	12·6	12·5
1889.							Oct. 1–10	2	12·0	12·2	1	12·2	12·2
Jan. 1–10	2	5·4	8·1	1	7·6	8·3	,, 11–20	2	10·8	11·5	1	10·7	11·8
,, 11–20	...	...	...	1	7·4	7·7	,, 21–31	1	10·5	11·3	2	9·6	11·0
,, 21–31	2	7·2	7·6	...	...	...	Nov. 1–10	1	10·8	11·2	...	...	...
Feb. 1–10	1	7·2	7·4	4	6·9	7·3	,, 11–20	2	9·5	10·4	...	...	...
,, 11–20	3	6·3	6·5	2	6·2	6·6	Dec. 1–10	1	9·1	10·0	...	...	...
,, 21–28	1	5·6	6·8	...	...	...	,, 21–31	2	6·2	8·7	...	...	...
Mar. 1–10	3	4·7	6·5	2	5·3	6·7	1892.						
,, 11–20	1	6·4	6·8	2	6·1	6·8	Mar. 10–20	1	4·6	6·1	...	...	...
,, 21–31	...	...	...	2	6·9	6·8	,, 21–31	4	5·7	6·0	2	6·0	5·8
Apr. 21–30	...	...	...	1	7·7	7·2	Apr. 1–10	2	6·3	6·1	...	...	...
July 1–10	1	12·2	9·1	1	12·6	9·0	,, 11–20	...	...	...	2	6·8	6·2
,, 11–20	2	10·8	9·4	1	11·7	9·2	,, 21–30	1	6·6	6·2	...	...	...
Sept. 11–20	...	...	...	1	12·9	12·7	June 1–10	5	13·5	...	5	13·7	...
,, 21–30	1	11·7	11·9	1	12·1	11·8	,, 11–20	1	9·5	...	...	...	...
Oct. 1–10	3	11·1	11·2	2	11·1	11·2	Sept. 11–20	1	12·0	11·9	1	11·8	11·7
,, 11–20	2	10·4	10·9	...	...	...	,, 21–30	1	11·1	11·2	2	11·1	11·2
,, 21–31	1	9·6	11·1	2	10·0	10·9	Oct. 1–10	1	10·4	11·3	...	...	...
Nov. 1–10	2	10·0	10·2	1	10·2	10·2	,, 11–20	2	10·1	10·6	...	...	...
,, 11–20	2	10·1	10·5	2	9·5	10·2	,, 21–31	1	10·3	10·4	1	10·0	10·0
,, 21 30	2	9·6	10·0	...	...	...	Nov. 1–10	3	9·8	10·0	...	...	...
Dec. 1–10	4	8·9	9·4	1	8·2	8·3	,, 11–20	3	9·3	9·6	...	...	...
,, 11–20	4	7·7	8·7	...	...	...	,, 21–30	1	9·9	10·0	1	8·8	9·5
							Dec. 1–10	2	7·7	8·8	1	8·3	9·3
							,, 11–20	4	7·8	8·5	...	...	...
							,, 21–31	2	7·4	7·5	...	...	...

CRUISER OBSERVATIONS—ROTHESAY.

Monthly Means.

Month.	9 A.M.			3 P.M.		
	No. of Observations.	Surface.	10 fathoms.	No. of Observations.	Surface.	10 fathoms.
1887.						
April	1	7·0	6·5	2	7·8	7·2
May	3	7·9	7·0	4	9·2	7·1
June	3	9·2	8·7	3	9·4	7·8
October	17	11·1	11·2	15	11·1	11·3
November	19	8·8	9·4	17	9·1	9·7
December	19	7·0	8·6	20	6·9	8·4
1888.						
January	12	6·8	7·6	11	6·8	7·6
February	8	5·7	6·7	9	5·9	6·6
March	6	5·4	6·1	4	5·6	6·3
May	4	7·1	6·3	4	7·3	6·9
October	21	10·2	10·2	16	10·2	10·3
November	9	9·0	9·5	9	9·3	9·5
December	11	7·5	8·9	9	8·2	9·0
1889.						
January	4	6·3	7·8	2	7·5	8·0
February	5	6·4	6·9	6	6·5	6·9
March	4	5·5	6·6	6	6·1	6·8
April	...	...	...	1	7·7	7·2
July	3	11·5	9·2	2	12·1	9·1
September	1	11·7	11·9	2	12·5	12·2
October	6	10·4	11·1	4	10·5	11·0
November	6	9·9	10·2	3	9·8	10·2
December	8	8·3	9·0	1	8·2	8·3
1890.						
January	4	7·1	7·7	6	7·2	7·7
February	4	6·0	7·2	3	5·7	7·3
March	2	6·8	6·8	2	7·0	6·9
April	3	7·4	7·2	1	7·4	7·2
May	3	9·1	8·5	...	...	...
September	4	13·3	12·7	3	13·3	12·7
October	6	12·0	12·2	2	11·8	11·9
November	2	10·2	11·3	1	10·8	11·2
December	1	8·6	10·3	1	7·8	8·4
1891.						
January	5	7·5	7·4	3	7·9	7·8
February	4	5·7	6·7	1	6·5	6·8
March	2	5·8	6·4	2	6·0	6·3
April	4	7·1	6·8	2	7·2	6·7
May	2	7·6	6·5	1	8·5	6·6
September	2	12·3	12·2	1	12·6	12·5
October	5	11·1	11·7	4	10·8	11·7
November	3	10·1	10·8	...	...	...
December	3	7·6	9·3	...	...	...
1892.						
March	5	5·1	6·0	2	6·0	5·8
April	3	6·4	6·1	2	6·8	6·2
June	6	11·5	...	5	13·7	...
September	2	11·5	11·5	3	11·4	11·4
October	4	10·3	10·8	1	10·0	10·0
November	7	9·7	9·9	1	8·8	9·5
December	8	6·7	8·3	1	8·3	9·3

CRUISER OBSERVATIONS—STORNOWAY LOCH.

Ten Day Means.*

Period.	9 A.M.			3 P.M.		
	No. of Observations.	Surface.	5 fathoms.	No. of Observations.	Surface.	5 fathoms.
1887.						
June 1–10	3	11·8	...	4	11·8	...
,, 11–20	5	12·9	...	4	10·0	...
,, 21–30	4	14·1	...	5	14·4	...
Nov. 21–30	3	8·3	8·5	4	8·9	8·7^{3}
Dec. 1–10	5	8·5	8·9^{4}	5	8·3	9·0^{3}
,, 11–20	5	6·8	7·3^{4}	5	6·4	7·8
,, 21–31	2	7·3	7·5	3	7·5	7·8
1888.						
Jan. 21–31	4	7·6	7·8^{2}	4	7·8	7·5^{3}
Apr. 1–10	6	6·5	6·4^{5}	6	6·6	6·4^{4}
,, 11–20	2	6·4	6·3^{1}	1	6·5	6·5
May 11–20	3	9·1	7·6	2	10·1	7·9
,, 21–31	4	9·0	8·5	3	9·4	9·3
June 1–10	5	8·6	9·0^{3}	3	8·5	8·5
,, 11–21	5	10·2	8·8	3	11·8	9·2
,, 21–30	4	12·6	11·1	5	13·9	11·8
July 1–10	4	12·0	11·7	4	11·8	11·8^{3}
,, 11–20	1	12·8	...	...	...	...
Sept. 21–30	1	12·2	12·2	1	12·3	12·3
1889.						
May 11–20	3	9·6	9·4	4	10·7	9·4
,, 21–31	4	10·9	9·5	2	11·1	9·4
June 11–20	5	11·1	10·2	3	11·2	10·3
,, 21–30	3	·13·8	12·4	1	14·6	12·9
1890.						
Apr. 1–10	3	7·2	7·1	4	7·1	...
,, 11–20	4	7·2	7·8^{1}	1	7·1	7·1
May 21–31	1	10·1	10·0	2	11·3	9·7
June 1–10	2	10·1	10·0	2	10·4	9·9
,, 11–20	3	10·9	10·6	2	12·0	11·1
,, 21–30	4	11·0	10·5	1	10·8	10·4
1891.						
May 21–30	5	9·0	8·6	5	9·2	8·5
June 1–10	3	10·8	9·5	4	11·4	9·7
,, 11–20	3	10·2	9·9	3	10·8	10·1
,, 21–30	9	13·2	11·6	7	13·0	11·8^{6}
July 1–10	3	11·7	11·2	2	12·1	11·1
1892.						
May 1–10	2	7·4	7·2	1	7·3	7·2
,, 11–20	1	8·3	7·9^{2}	2	7·9	7·7
,, 21–31	4	8·5	8·0	3	8·7	8·2
June 1–10	1	8·5	8·5	2	9·5	9·1
,, 11–20	4	10·1	10·0	6	10·2	9·9^{5}
,, 21–30	10	10·4	10·0	10	10·6	10·1
July 1–10	5	9·9	9·5	5	9·9	9·4

* *Note.*—The small figures following the temperature indicate the number of observations from which that mean was calculated. When no such figure occurs the number of observations used in determining the mean is the same at all depths.

CRUISER OBSERVATIONS—STORNOWAY LOCH.

Monthly Means.*

Month.	9 A.M.			3 P.M.		
	No. of Observations.	Surface.	5 fathoms.	No. of Observations.	Surface.	5 fathoms.
1887.						
June	12	12·9	...	13	12·1	...
November	3	8·3	8·5	4	8·9	8·7^{3}
December	12	7·5	7·9^{10}	13	7·4	8·2^{11}
1888.						
January	4	7·6	7·8^{2}	4	7·8	7·5^{3}
April	8	6·5	6·3^{6}	7	6·6	6·4^{5}
May	7	9·0	8·0	5	9·8	8·6
June	14	10.5	9·6^{12}	11	11·4	9·8
July	5	12·4	11·7^{4}	...	...	...
September	1	12·2	12·2	1	12·3	12·3
1889.						
May	7	10·3	9·5	6	10·9	9·4
June	8	12·5	11·3	4	12·9	11·6
1890.						
April	7	7·2	7·5^{4}	5	7·1	7·1^{1}
May	1	10·1	10·0	2	11·3	9·7
June	9	10·7	10·4	5	11·1	10·5
1891.						
May	5	9·0	8·6	5	9·2	8·5
June	15	11·4	10·3	14	11·7	10·5^{13}
July	3	11·7	11·2	2	12·1	11·1
1892.						
May	7	8·1	7·7^{8}	6	8·0	7·7
June	15	9·7	9·5	18	10·1	9·7^{17}
July	5	9·9	9·5	5	9·9	9·4

CRUISER OBSERVATIONS—INVERGORDON, CROMARTY FIRTH.

Ten Day Means.*

Period.	9 A.M.			3 P.M.		
	No. of Observations.	Surface.	10 fathoms.	No. of Observations.	Surface.	10 fathoms.
1887.						
Aug. 21–31	5	14·0	...	3	14·1	...
Sept. 1–10	9	13·3	12·3^{2}	8	13·2	12·4^{1}
,, 11–20	1	11·9	...	1	11 9	...
Nov. 1–10	5	7·4	...	6	7·8	...
,, 11–20	6	7·2	...	5	7·0	...
1888.						
Jan. 21–31	2	5·1	5·8^{1}	2	5·1	5·8^{1}
Mar. 21–31	2	3·5	3·5	1	3·5	3·5
1889.						
July 1–10	1	14·0	13·5	1	14·0	14·0
,, 11–20	1	14·1	13·9	1	14·2	13·8
Aug 1–10	3	16·1	16·1	1	16·6	15·7
,, 21–31	5	13·0	13·4	...	...	...
Sept. 1–10	1	13·6	13·5	1	13·9	13·4
,, 21–30	2	12·2	11·5	...	...	...
Nov. 21–30	1	8·9	9·3	1	8·8	8·9
1890.						
Feb. 21–28	2	4·5	5·0	3	4·8	5·1
July 11–20	2	13·0	12·7	2	13·0	12·6
,, 21–31	2	13·3	12·1	1	11·8	11·8
Aug. 1–10	4	13·2	12·8	3	13·4	12·4
,, 11–20	3	13·3	12·6	3	13·1	12·6
,, 21–31	1	12·7	12·3	...	...	...
Sept 11–20	2	13·6	13·3	4	13·8	13 4
,, 21–30	4	13·3	13·0	3	13·4	12·9^{2}
1890.						
Oct. 21–31	1	9·7	9·7	1	9·7	9·8
Nov. 1–10	3	9·3	9·9	2	9·3	9·8
Dec. 1–10	4	5·1	7·7	3	4·7	7·5
1891.						
Jan. 21–31	4	3·9	5·0	4	3·9	...
Feb. 1–10	1	4·0	5·0	1	4·2	...
,, 21–28	2	5·6	5·7	2	5·6	5·7
Mar. 1–10	5	5·4	5·7	4	5·4	5·5
April 11–20	2	6·8	5·7	2	6·9	6·1
,, 21–30	2	7·0	6 5	1	6·8	6·5
Sept. 1–10	5	12·7	12·3	4	12·4	12·1
,, 21–30	4	11·7	11·8	4	11·9	11·8
Oct. 21–31	6	9·0	10·4	5	9·2	10·7
Dec. 1–10	3	6·6	7·4	2	6·7	7·4
1892.						
Feb. 11–20	1	2·6	...	1	2·4	...
,, 21–29	3	2·2	3·6^{2}	3	2·3	4·0^{1}
July 1–10	2	11·2	10·7^{1}	2	11·8	10·6^{1}
,, 11–20	1	11·9	10·9	...	..	...
,, 21–31	3	13·9	13·1	4	13·1	12·3^{3}
Aug. 1–10	1	14·3	12·1	1	14·5	12·1
Oct. 1–10	5	10·2	10·3^{3}	4	10·4	10·3
,, 11–20	7	8·3	9·7	7	8·5	9·8
,, 21–31	1	8·5	9·2	...	...	...
Dec. 11–20	1	5·7	6 1	...	...	...

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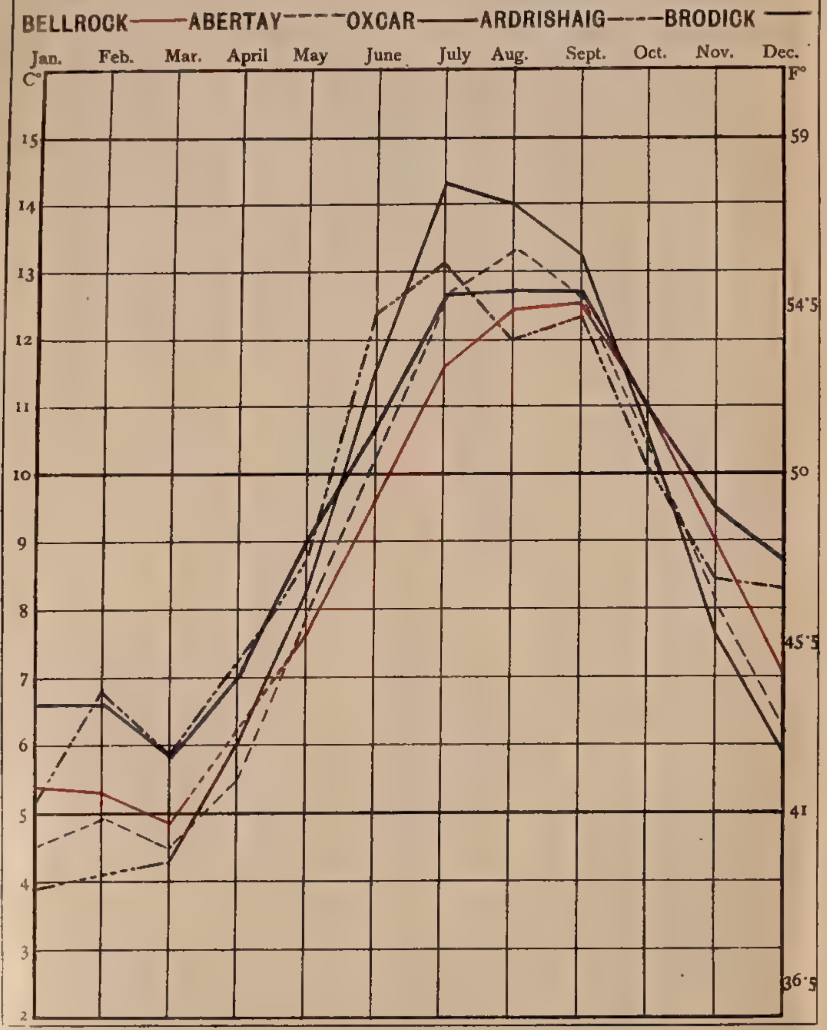
* See note, p 483.

PLATE XVIII

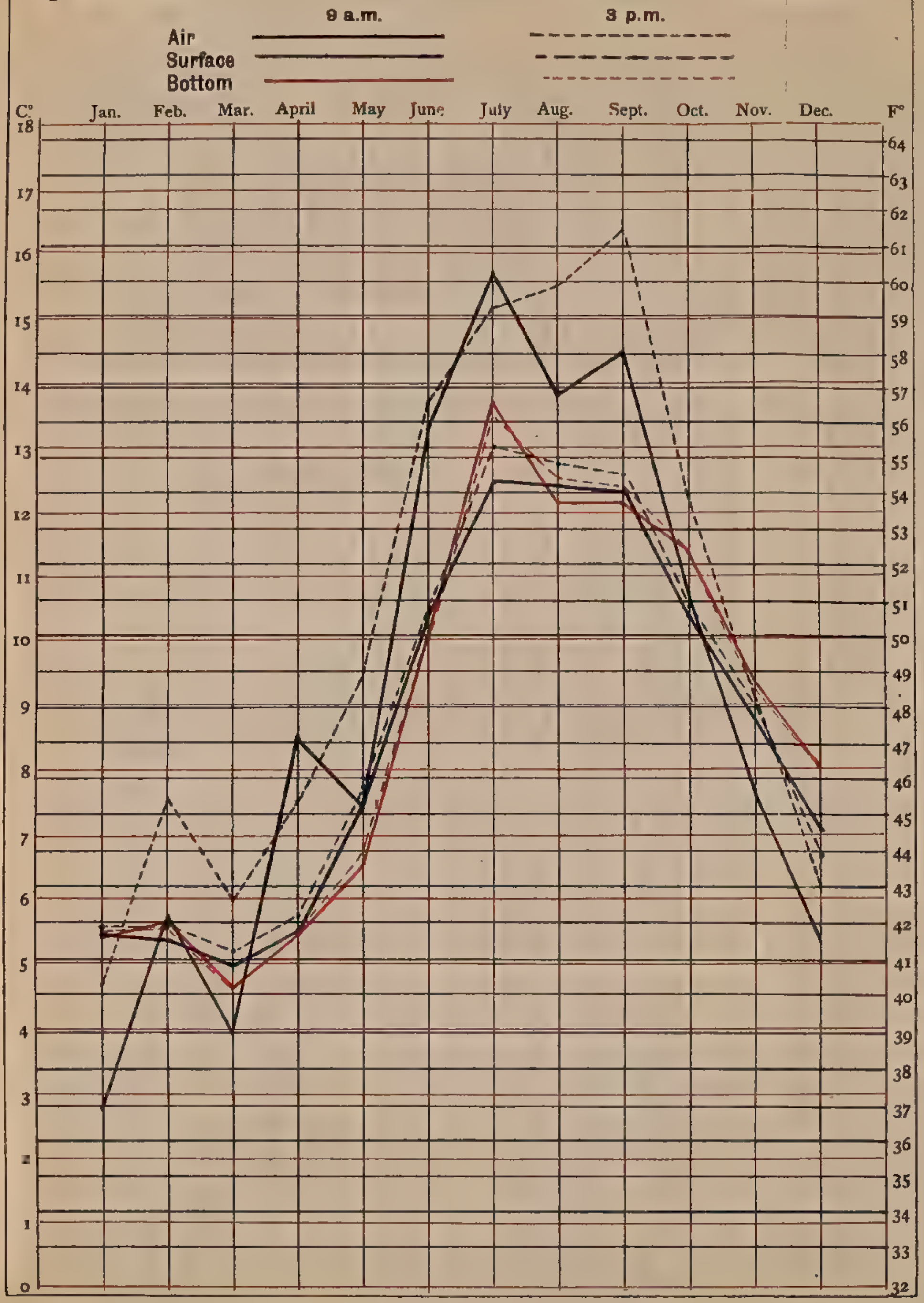
CURVE OF MONTHLY MEANS.

Fig. No. 1.—1891. Surface Temperature, 9 am.



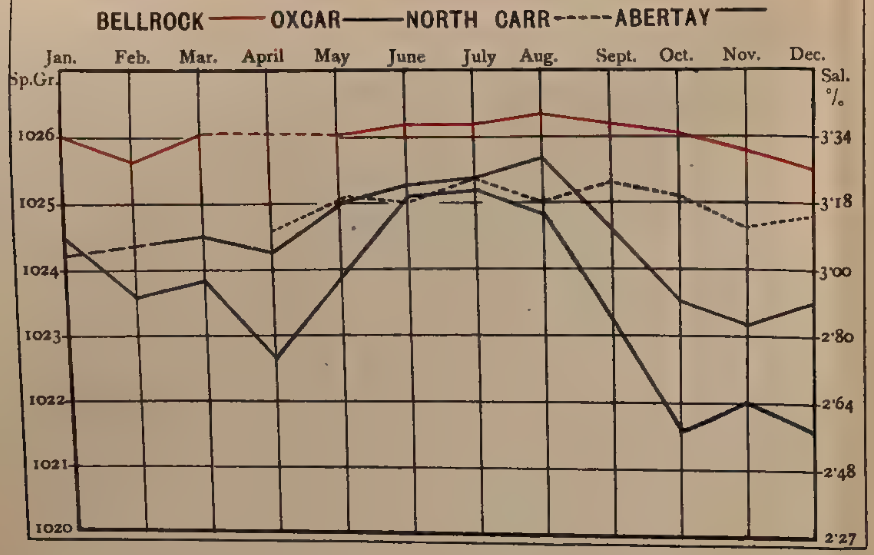
NORTH CARR.—MONTHLY MEANS.

Fig. No 2.—1891. Temperature.



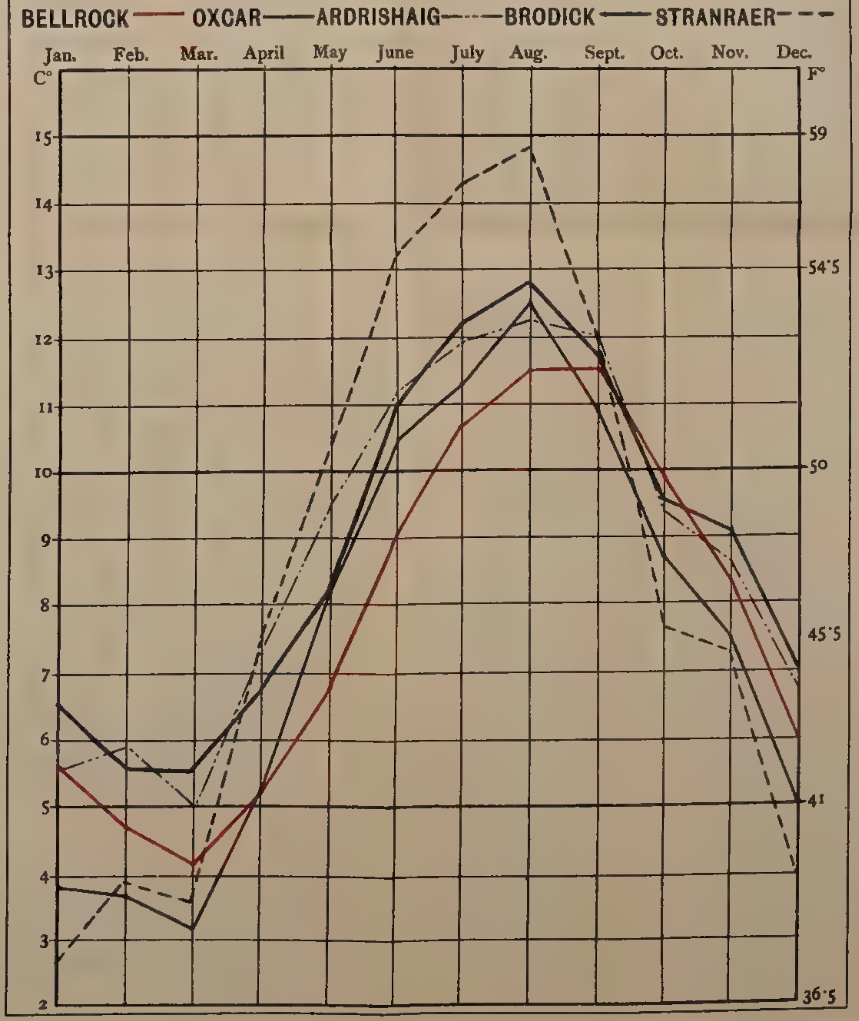
CURVE OF MONTHLY MEANS.

Fig. No. 3.—1891. 9 a.m. Observations.



CURVE OF MONTHLY MEANS.

Fig. No. 4.—1892. Surface Temperature, 9 am.



Afternoon Temperatures and Specific Gravities of Surface and Bottom Waters at Abertay and North Carr Light Vessels.

Fig. No. 5.—1892.

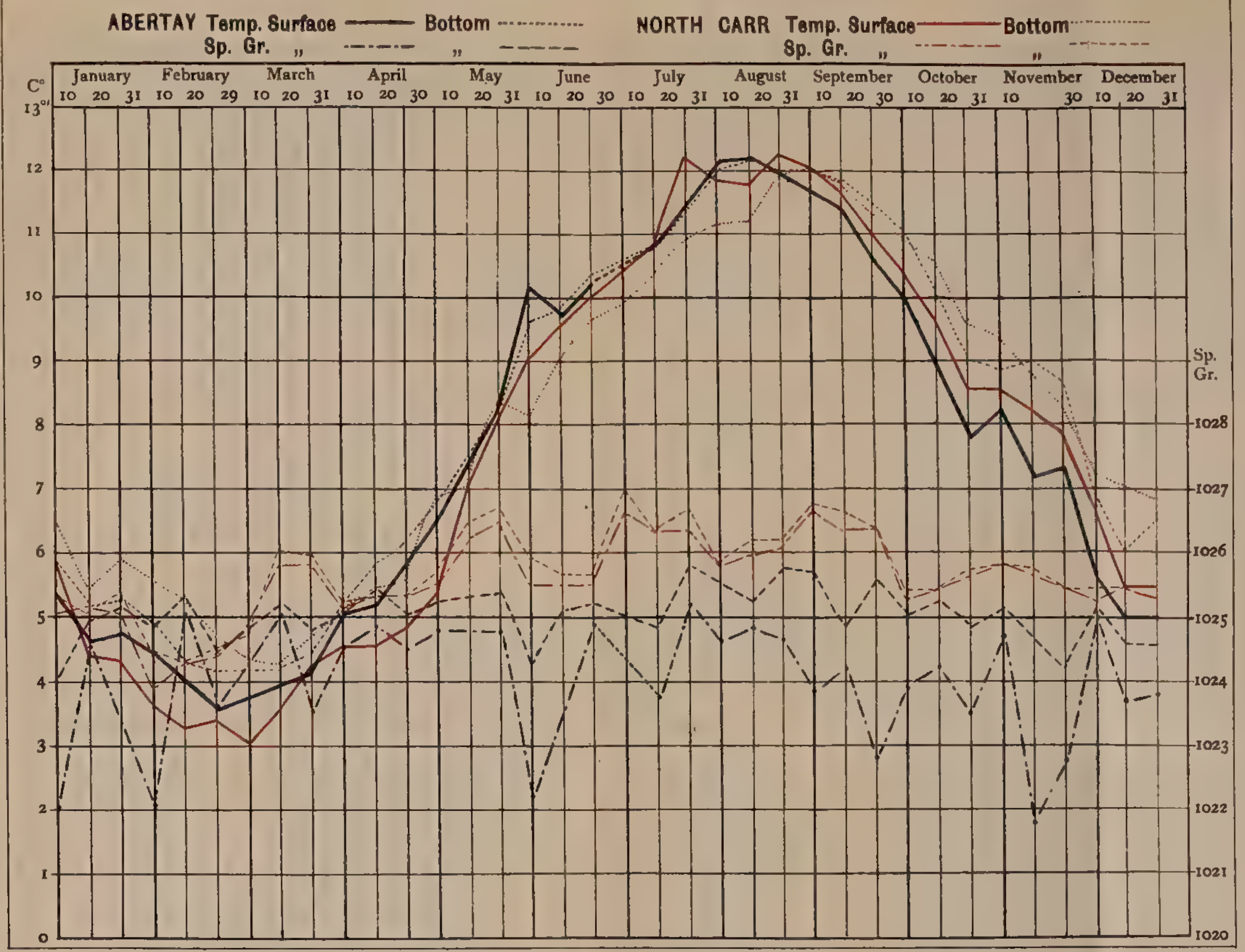
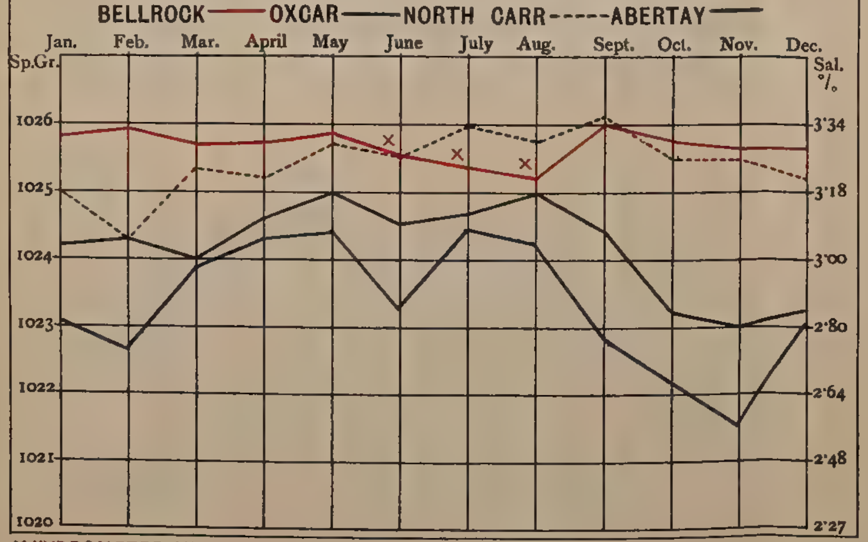


Fig. No. 6.—1892. CURVE OF MONTHLY MEANS. 9 a.m. Observations.

Specific Gravity and Salinity of Surface Water.



× HYDROMETER OUT OF ORDER.

CRUISER OBSERVATIONS—INVERGORDON, CROMARTY FIRTH.

Monthly Means.*

Month.	9 A.M.			3 P.M.			Month.	9 A.M.			3 P.M.		
	No. of Observations.	Surface.	10 fathoms.	No. of Observations.	Surface.	10 fathoms.		No. of Observations.	Surface.	10 fathoms.	No. of Observations.	Surface.	10 fathoms.
1887.							1891.						
August	5	14·0	...	3	14·1	...	January	4	3·9	5·0	4	3·9	...
September	10	12·6	12·3[2]	9	12·5	12·4[1]	February	3	4·8	5·3	3	4·9	5·7[2]
November	11	7·3	...	11	7·4	...	March	5	5·5	5·7	4	5·4	5·5
1888.							April	4	6·9	6·1	3	6·8	6·3
January	2	5·1	5·8[1]	2	5·1	5·8[1]	September	9	12·2	12·0	8	12·1	11·9
March	2	3·5	3·5	1	3·5	3·5	October	6	9·0	10·4	5	9·2	10·7
1889.							December	3	6·6	7·4	2	6·7	7·4
July	2	14·0	13·7	2	14·1	13·9	1892.						
August	8	14·5	14·8	1	16·6	15·7	February	4	2·4	3·6[2]	4	2·3	4·0[1]
September	3	12·9	12·5	1	13·9	13·4	July	6	12·3	11·6	6	12·5	11.5
November	1	8·9	9·3	1	8·8	8·9	August	1	14·3	12·1	1	14·5	12·1
1890.							October	13	9·0	9·7	11	9·5	10·0
February	2	4·5	5·0	3	4·8	5·1	December	1	5·7	6·1	...	...	...
July	4	13·2	12·4	3	12·4	12·2							
August	8	13·1	12·6	6	13·3	12·5							
September	6	13·5	13·2	7	13·6	13·1[6]							
October	1	9·7	9·7	1	9·7	9·8							
November	3	9·3	9·9	2	9·3	9·8							
December	4	5·1	7·7	3	4 7	7·5							

SECTION D.—CONTEMPORARY WORK.

AN ACCOUNT OF CONTEMPORARY SCIENTIFIC FISHERY WORK AND FISHERIES IN THIS AND OTHER COUNTRIES. By Dr T. Wemyss Fulton, F.R.S.E., Superintendent of Scientific Investigations.

In the following pages I have, as far as possible, summarised the information available as to the condition of the sea fisheries in the more important countries which possess sea fisheries, and the various means employed for their regulation and improvement. The amount of literature—official and scientific—dealing with those subjects which now reaches me is very considerable, and is increasing; and this summary is made possible only by the courteous co-operation of those engaged in fishery work in this country and abroad.

In perusing the reports and publications referred to, one is greatly impressed with the energy displayed by the various Governments and fishery departments in organising, regulating, and developing in every way possible the sea fisheries under their charge. It would be difficult or impossible to point to any other important industry in which greater advances in knowledge have been made during the last decade; but a great deal yet remains to be done, especially, perhaps, in organising a proper system of fishery statistics. In several countries the statistics relating to the sea fisheries are very imperfect. It would be of immense value in the future to the fisheries of the North Sea, for example, if it were possible to devise and carry out in the various countries concerned a system of statistics which would show the quantities of the different kinds of fish annually caught within its waters, with the numbers of men and boats employed.

I have to thank many foreign fishery authorities for assistance in this department; not merely in supplying reports and publications referring to their work, but in furnishing, promptly and readily, all information in their power on points submitted to them.

Among these I may mention M. Raveret-Wattel, Secretary to the Societé d'Acclimitation de France; Dr P. P. C. Hoek, Scientific Superintendent of Dutch Fisheries; Captain Drechsel, the Superintendent of Danish Fisheries, and the Naturalist, Dr Petersen; Professor Pouchet, the Director of the Concarneau Laboratory; Professor Marion, the Director of the Laboratoire d'Endoume, Marseille; Captain Dannevig, the Superintendent of the well-known hatchery at Flödevig; Señor Rafael Gutierren Vela, of the Spanish Fisheries Department; Sir Charles Tupper, the High Commissioner for Canada; Mr Nielsen, the Superintendent of the Newfoundland Fisheries; Professor Giglioli, of Florence, Fishery Commissioner; His Highness Prince Albert of Monaco; Baron Jules de Guerne and M. Jules Richard; Drs Malm and Lundberg, the Inspectors of Swedish Fisheries; Dr Sauvage, Director of the Marine Station, Boulogne-sur-Mer. Among those at home who have been always willing to co-operate, I must specially mention Sir Thomas F. Brady, the Inspectors of Irish Fisheries, and Professor M'Intosh, F.R.S.; also Mr W. L. Calderwood, until lately the Director of the Marine Biological Association's Laboratory at Plymouth; Mr Ernest W. L. Holt; Mr Olsen, Secretary of the Grimsby Marine Fisheries Society; and Mr J. Wrench Towse, the Honorary Secretary to the National Sea Fisheries Protection Association.

I. UNITED KINGDOM.

The numbers of the *Journal of the Marine Biological Association*, which have been issued since the last Annual Report appeared, contain several papers dealing with fisheries. Among these, those of Mr Ernest W. L. Holt are of special interest, inasmuch as they are concerned with important practical questions. In the first* Mr Holt gives the results of his investigations at Grimsby on the relation of size to sexual maturity in pleuronectids, and on the destruction of immature fish in the North Sea. He describes the characteristics of the ovary in flat-fish which serve to distinguish fish which have spawned from those which have never spawned, and states that in the halibut, long rough dab, turbot, brill, megrim, plaice, flounder, and common dab, 'when retained ova are not present to 'place the matter at once beyond doubt, a spent can always be distin- 'guished from an immature ovary by the wide flaccid anterior region, by 'the greater length of the posterior process, and by the loose manner in 'which the latter is lodged in the cavity alongside of the hæmal spines.' The common sole, lemon sole, and witch or pole dab present more difficulty.

In dealing with the limits of size in relation to maturity, Mr Holt gives the following as representing the average sizes at which the female spawns for the first time in the North Sea:—turbot 18 inches, brill 15 inches, common sole 12 inches, plaice 17 inches, lemon sole 12 inches, halibut (provisional) 36 inches, common dab 7 inches. The male turbot and brill seem to become mature at about 12 to 15 inches. A male plaice only 6 inches in length was found to be mature, but this Mr Holt regards as probably altogether exceptional; and a female was ripe at 13 inches, and several others at 15 inches. In the common sole the male reaches maturity usually when about 10 inches long, in one case when only 8 inches, and in several others at 9 inches. The smallest ripe female was 10½ inches. The spawning period of the sole extends from the end of April to the beginning of August, but is most marked in May and June. It is pointed out that spent females begin to appear in the Humber at the beginning of July, and continue to abound during August and September. The smallest ripe male lemon sole which Mr Holt obtained was 6 inches long, and the smallest ripe female 10 inches. In another paper on the subject† Mr Holt gives similar details of his investigations of cod and haddock. The size limit he provisionally assigns to the female cod is 25 inches; the smallest ripe female was 26½ inches, and the smallest ripe male 22 inches. The provisional size limit applied to the haddock is 13 inches; the smallest ripe female was 15 inches (but one at 11 inches was nearly mature), the male becomes mature at about 11 inches. In both the papers referred to, Mr Holt treats fully the question of the capture and destruction of immature fish, and indicates the enormous numbers of young flat-fish destroyed by the beam-trawl. In the five months, April to August 1892, 10,119 boxes of small plaice (ranging from 7 to 13 and rarely to 15 inches) were landed by beam-trawlers at Grimsby alone; and

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* *Journal*, vol. ii., No. 4, p. 363.

† *Journal*, vol. iii., No. 1, p. 78, 1893.

Mr Holt calculates that they contained over two and a half millions of fish. These small plaice extend along the coast of Holland, Hanover, and Denmark, as far north as the Horn Reef, and from thence to Hantsholm on the coast of Jutland. Large quantities of immature turbot are also caught on the eastern grounds; during June, of 4623 landed, only 786 were of mature size, the proportion of immature being 82 per cent. Young lemon soles are not found on these grounds, nor young common soles. The destruction is greatest in the summer months. Similar details are given by Mr Holt in reference to cod, haddock, &c., and he describes a large number of observations he has made into the capture and destruction of immature fish by shrimp-trawling. His observations* show that the great majority of the small fish caught survive when returned to the sea, and that their capture in a shrimp-trawl, in the ordinary course of the industry, is not essentially injurious to any considerable proportion of young fish of marketable species. These observations confirm my own on the subject,† and they were instrumental in bringing about a modification of a bye-law of the North-Eastern Sea Fisheries District Committee. Mr Holt also describes the capture of immature fish by other modes of fishing.

In the same number Mr J. T. Cunningham publishes a paper on the immature-fish question, in which the fishery statistics for England and Wales since 1886 are subjected to careful analysis, and the results of the cognate scientific inquiries are described. Lemon soles, both female and male, were found mature when 7 inches long—thus differing from the specimens caught on the East coast; and Mr Cunningham is of opinion that no case has been made out for any interference with the capture, landing, or sale of lemon soles. It was also found that female plaice might become mature on the South coast when only 9 inches long. Mr Cunningham also gives an abstract of his researches on the coloration of the skins of flat-fishes.

In a paper on 'the probable ages of young fish, collected by Mr Holt 'in the North Sea,' Mr J. T. Cunningham continues his researches on the rate of growth of the food-fishes. The conclusions are based upon the lengths of the specimens, in relation to the time that had elapsed since the spawning season; and tables are given regarding the plaice, flounder, dab, sole, brill, turbot, cod, whiting, haddock, &c. Mr Cunningham refers to the difficulty of fixing the maximum size of specimens derived from the immediately preceding spawning season. He fixes it in the case of the plaice at 3 inches, referring larger specimens to the spawning of the previous year. Some plaice (caught on 29th January) from 1¾ to 2⅛ inches long, he believes to be at least eight or nine months old. Similar particulars are given regarding the other fish; but, as Mr Cunningham points out, the undoubted variability in the rate of growth of different specimens of the same species, and the length of the spawning season, make it very difficult to draw conclusions from such observations.

The same number of the *Journal* contains a paper by Mr W. L. Calderwood, on the 'Ovary and Intra-ovarian Egg in Teleosteans,' which deals chiefly with the state of the mature ovary, in its various conditions of sexual activity or repose, especially in the dab and the hake. He considers that in the ripening ovaries, ova for three consecutive spawning seasons are present, the great, small, and minute, and each of these are described.

There are a number of short papers on the marine invertebrates of the district, &c.

Lancashire Sea Fisheries District Committee.—In previous Reports

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* *Journal*, vol. iii., No. 1, p. 98 *et seq.*

† Vide *Ninth Annual Report*, Part III., p. 207.

I have referred to the work of this Committee. Since it may be taken as a model—as it is certainly the most energetic—of the English District Committees formed under the Sea Fisheries Regulation Act, 1888, the following account of its organisation, &c., will be interesting. I am indebted for it to Mr R. L. Ascroft, one of the most active members of the Committee.

The district extends from Haverigg Point, in the county of Cumberland, to a line drawn from Hilbre Island, in the county of Chester, in the direction of the North-West Light Ship in Liverpool Bay. The contributing authorities to the expenses of the Joint-Committee for the district are the counties of Lancaster, Cumberland, and Chester, and the County Boroughs therein. The Joint-Committee is composed of twenty-eight members appointed by the Board of Trade, three representatives of the Salmon Conservators of the rivers Ribble, Linn, and Dee, and thirty representatives nominated by the contributing authorities, and one nominated by the borough of Southport, in the county of Lancaster. The total rateable value of the different contributing areas, excluding the county of Chester and the county of Cumberland (which have fixed contributions of £30 each) is £20,832,420.

In the district are 25 steam-trawlers, manned by 225 men; 115 first-class sailing-trawlers, manned by 555 men; 332 second-class trawling, line, and shrimping boats, manned by 620 men; 193 open boats, manned by 293 men, used in shrimping, musselling, cockling, and line fishing, and 141 horses and carts (used for shrimping, cockling, and musselling, and attending to the stake-nets, of which 30 are used principally for shrimping), and 330 persons. There are also 40 donkeys used for musselling and cockling, and 370 persons who fish on the shores without boats or carts. The total active fishing population is thus 2393.

The steam-trawlers do not fish in the territorial waters, and do very little work anywhere near the district, simply using the ports on account of their nearness to the markets. The first-class sailing-boats come into the district for a few months (if allowed) during the autumn months when the soles are near the shore. The second-class boats are used for shrimping for both *Crangon vulgaris* and for *Pandalus annulicornis*, for trawling, line fishing, and a few at Morecambe for herring fishing. The different methods of fishing used in the district are, for flat-fish (1) beam-trawling; (2) draw or draught nets, used by two men wading, and also, in the usual way, shot from a boat and hauled to the shore; (3) stake-nets, the balk or net set across depressions in the sand called 'Lyrings' (I suppose a corruption from 'lairings'), set in a semicircle, and arranged to lift on the flood and drop to the ground on the ebb; (4) stream-nets, called in some parts trammel-nets, set across a strong tide, without touching the ground, the fish are held in the slack of the net by the pressure of water against it; (5) 'keadle'-nets (corresponding, I suppose, to the '*Redellas*' of *Magna Charta*), consisting of two wings, with a long pouch of net between them, corresponding to the trawl-net behind the foot-rope. I have seen instances in which the keadle-nets were arranged to have the fish guided into one pocket with the flood, and into another on the ebb, but it had three guides instead of two; (6) tees or lines set on shore or at sea, having snoods of horse-hair every 2 feet, and having, instead of a hook, a pin bent to an obtuse angle, so that when taken by a fish it forms a toggle across the mouth; (7) fluke-rakes, or rakes of 3 feet wide at the head, and having barbed teeth every 4 inches set in line with the shaft, and used by probing into the sand as the boat drifts with the tide.

Cod and skate are taken by long lines baited with a worm found near low water; small flukes, herring, and sometimes whelks, or, as they are termed here, 'buckies.' The lines are mostly underrun and not lifted and re-shot.

Shrimps (*Crangon*) are taken (1) by trawl-nets of two types, one resembling a fluke-trawl, but with smaller meshes, and having a rope-foot or ground-rope, and the other a shorter net from beam to cod end, with a chain foot-rope. The boats using the first kind employ one net up to a 25-foot beam. Those using the chain ground-rope use two 20-foot beams, and are the only boats which use the Barking or stirrup-irons, all other boats using nearly the Brixham pattern. (2) Shank-nets, which are a development of the hand-shove net. These nets are 10 feet wide, and each boat drags four, covering, therefore, 40 feet. They consist of a beam, lying on the ground, of pitch pine or greenheart, weighted with twenty pounds of iron, and iron uprights to carry a piece of wood for the top of the net to be fastened to. Altogether there are thirty-one pounds of iron to weigh the wood on the ground, and so stir up the shrimps out of the sand. (3) Stake-nets are also used for shrimps, being simply bag-nets, stretched between stakes, and are dry at low water. (4) Hand-nets are also used 7 feet wide, and the fishermen have wading suits, so as to be able to follow their fishing in winter. (5) Horses and carts are used for shrimping of late years; they drag three shank-nets behind the cart, having a boom across the shafts, to the ends of which the warps are fastened to give a spread to the nets; a man or lad drives the horse, and sorts the shrimps in the cart.

'Sprawns,' as they are locally called (*Pandalus annulicornis*), are taken only by trawl-nets, with heavy Manilla ground-ropes, wound with chain or wire-rope, so as to lay weight on the bottom. As the 'Knarrs' or 'Ross' (sand ridges built up by the agency of *Sabellaria*), on which the prawns lie to feed on the *Sabellaria*, are very destructive to the nets. The nets are heavily clouted on the under side.

Hand-line fishing for codling is much followed in the channels, the bait being principally the common lug-worm. Cockles are taken (1) by means of a rake with three teeth, locally called a 'craam,' the cockles are then got by show (excreta, or the holes left by the withdrawal of the syphons, and sometimes by zoophytes growing on the shell); (2) by rakes a foot wide, and numerous teeth; and also (3) by shovel and riddle, surface sand containing the cockles being taken and riddled, leaving the cockles in the riddle. They are also made to come to the surface by means of the 'jumbo' (a recent invention), made of a piece of wood, from 4 to 10 feet long, a foot broad, and from 1 to 3 inches thick (the shorter the thicker), having two handles perpendicular to the surface of the board, about 3 feet high. It is used by being rocked backwards and forwards on wet sand, so as to render it lively or 'wicky,' and all hard substances rise to the surface, and the cockles are picked up; thus imitating the gulls in their method of cockling. Mussels are got off the dry beds by hand, and out of the water in boats by rakes about 2 feet 6 inches wide, having teeth about 9 inches long, and shafts ranging from 10 to 40 feet long, according to the depth of water the men have to work in. There are a few periwinkles (*Littorina*) gathered about Barrow. At Fleetwood, American oysters are stored; but there is, as a rule, too much sand moving with the tide to suit oyster cultivation. Although mussels do remarkably well transplanted to brackish water, doubling in length in six summer months.

The committee have made a number of bye-laws relating to the fisheries of the district. There has been considerable trouble with the fishermen in some districts, one hundred and seventy prosecutions having taken place, but the great majority are well satisfied with the bye-laws. The total value of the fisheries, excluding steam-trawling, is upwards of

£250,000 per annum. There is a superintendent (Mr R. A. Dawson), three chief sea-fishery officers, and four ordinary sea-fishery officers.

The officers are provided with boats. There is also a steamer, 85 feet long on the water-line by 17 feet broad, and 8½ feet draught, and of the gross registered tonnage 87, and nett tonnage 15. Engines 12 and 24 × 11″ stroke, with 120 lbs. steam pressure; the speed is 10·2 knots. It is a vrey good sea boat. There is also a sailing-boat of 27-feet keel and 34 feet over all, with a 10-feet beam and 9-feet centre board, and likewise another sailing-boat of 22 feet by 8 feet, and with a centre board, and three rowing boats.

The committee, with the consent of the authorities of University College, Liverpool, have established a laboratory at that place, which Professor Herdman, F.R.S., with his great zeal for marine zoology, gratuitously superintends, having Mr Corbin for his paid assistant.

The estimate for the year 1893–4 is £2800, included in which is a large payment for the steamer, and £410 for salaries and £825 for wages.

If the minimum size of fish allowed to be landed was fixed, there is no doubt that the superintendence of the Sea Fishery Committee would be greatly less needed.

The Report * by Professor Herdman, F.R.S., of the work done at the laboratory above referred to, contains much information of interest. The physical conditions of the district and the chief fishing-grounds are described, and lists are given of the fauna, surface life, &c. Special investigations have been made on the food of fishes, particularly the sole and plaice, and also with the view of determining, for the part of the coast in which the district is situated, the minimum size at which the various species of fish become sexually mature. The Lancashire Committee now possess a steam-vessel, referred to above by Mr Ascroft, which has been specially built and equipped for fishery work, and which is much superior to the one belonging to the Fishery Board for Scotland. By means of this vessel important investigations are being made, the system or plan adopted, as Professor Herdman points out, being similar to that employed on the 'Garland.'

Professor Herdman also strongly recommends that experiments in sea-fish hatching should be begun on a proper scale, and that a sea-fish hatchery for the district should be established at Port Erin, where the physical conditions seem to be eminently suitable for the purpose. As befits a district in which shrimp fishing is of much importance, experiments in the culture of this crustacean are recommended by the enclosure of suitable creeks.

The food of the cockle was investigated by Professor Herdman, and the contents of the stomach were found to consist chiefly of spores and other young stages of lower algæ, filamentous algæ, fragments and other vegetable débris, diatoms, foraminifera, sponge spicules, fragments of minute crustacean appendages, such as Copepoda, and of the larval stages of higher crustacea, all mixed with sand grains. The cockle in the neighbourhood spawns in summer, many of those dissected in June and July being mature males and females, with fully-developed ova and spermatozoa. The number of ova produced is very great. Professor Herdman recommends that no cockles should be taken until they are adult and full-sized—about an inch in length; that the beds should be as little disturbed as possible, and that the young ones should not be removed from the sand or allowed to lie in heaps.

In the last Quarterly Report of the Superintendent—Mr Robert A.

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* *Report for* 1892 *on the Lancashire Sea Fisheries Laboratory.*

Dawson—interesting information is given concerning the capture of immature fish, which he finds to vary in abundance on the same grounds at different times of the year. Thus, in August, two drags of the shrimp-trawl in a certain part of the Mersey estuary, occupying altogether 3½ hours, produced 12,308 immature food fishes and 12 quarts of shrimps; while in November and December, five drags on the same ground, occupying in all 4½ hours, produced only 2067 immature food fishes, but captured 58½ quarts of shrimps. It is also stated that complaints are very general as to the harm done to the fisheries, especially on the cockle beds, by sea-birds, which appear to be rapidly increasing in numbers.

CANADA.

The total yield of the fisheries of the Dominion of Canada* in 1891 represented a value of 18,977,878 dollars (Nova Scotia alone being credited with 7,011,300 dollars), showing an increase of a million and a quarter of dollars over 1890. The values of the chief kinds of fish captured were—cod, 3,827,708 dollars; herrings, 2,294,914 dollars; salmon, 2,256,248 dollars; lobsters, 2,252,421 dollars; mackerel, 1,969,571 dollars. Seal-skins, which are included, were valued at 826,083 dollars. In regard to the fishermen and boats, it appears that 65,909 men, 30,438 boats, valued at 1,007,815 dollars, and 1027 vessels, valued at 2,125,355 dollars, and having a tonnage of 39,377 tons, were employed in the fisheries. 5,014,079 fathoms of gill-nets and seines, valued at 1,644,892 dollars, were made use of, and the gross value of the vessels, boats, and fishing gear was 7,376,186 dollars. In the voluminous reports from the various districts will be found many matters of interest. In Nova Scotia successful experiments have been made in freezing bait (squid) in refrigerators, and for the first time in the history of the fishery, fresh bait could be obtained in January. The fishermen started for the fishing grounds with a thin cake of ice, containing enough squid bait for one day's cod fishing, and the results have been very satisfactory. In one day 33,000 lbs. of cod and haddock were landed at Canso, and two men, in one boat, took 30 dollars' worth of fish in one day with the frozen bait.

In the report of Mr Samuel Wilmot, the superintendent of fish culture, it is stated that thirteen fish hatcheries, equipped with the most approved apparatus, are in operation, and that another will shortly be constructed in Manitoba. The lobster hatchery at Bay View, Pictou, is 75 feet long by 35 feet broad, with apparatus to accommodate about 90,000,000 eggs; it is provided with a 20-horse-power steam-boiler and duplex pump, and has also a wharf or pier in connection with it. Owing to the delay in getting the building and machinery into operation, hatching work was carried on for only fifteen days last season. No difficulties of moment were found in the actual hatching of the eggs or in planting the fry, but there appears to have been a difficulty in obtaining adequate supplies of the lobster eggs in good condition from the factories, where the lobsters are canned. From this circumstance, only 7,000,000 young fry were hatched and distributed. At the other hatcheries, 115,771,800 young fish were hatched and distributed, including 73,605,000 white fish of the Great Lakes, 15,000,000 pickerel, 9,990,000 salmon trout, and 6,133,000 of the Atlantic salmon (*S. salar*). Since the hatcheries were established in 1868, 911,529,700 fry have been hatched and planted, chiefly salmon, white fish, and pickerel.

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* *Fisheries Statements and Inspectors' Reports for the Year* 1891. Ottawa, 1892.

In the report of the Deputy-Minister of Fisheries,* it is stated that the gross expenditure of the department for all services, except civil government, amounted for the fiscal year to 374,202 dollars from appropriations of 428,420 dollars, leaving a surplus of 54,217 dollars. The revenue of the department from licences, &c., was 70,794 dollars. Of the expenditure, 71,306 dollars were spent on 'fisheries,' 39,496 on fish-breeding, 83,050 on fisheries protection service, 166,967 on fishing bounties, and 13,382 on miscellaneous objects. It is reported that the Fisheries Intelligence Bureau has greatly extended its operations. Fifty-two stations now send daily reports to Halifax, where, after compilation, the information is telegraphed to the principal business centres and fishing stations in the maritime provinces. In the fisheries protection service, eight steam-vessels and two sailing-vessels are employed. The total amount spent in 1891 in this department was 102,601 dollars, part of which falls against another department.

It is stated that, owing to the injurious results of fishing with the purse-seine, the department had no option but to conclude that the preservation of the valuable mackerel and herring fisheries of the Atlantic coast demanded its general prohibition. Without joint action on the part of the Governments of the United States and France, such a prohibition, the report goes on to say, cannot attain all that is desired so long as its use is continued by the fishermen of other nations. The United States Government have indeed prohibited the landing of mackerel taken by purse-seines on any part of their coast before 1st June in each year; but this does not afford any relief in Canadian waters beyond the territorial limits. Pending international agreement, the Canadian Parliament have by statute prohibited this mode of fishing in Canadian waters, under a penalty for each offence of between 50 and 500 dollars, together with confiscation of the vessel, boat, and apparatus used. Owing to disputes among the seine fishermen in Halifax county, the Government have applied the system so successfully made use of in other parts of the Dominion, namely, by prohibiting this mode of fishing within certain areas without a special licence from the Department of Fisheries, which is only granted on certain specified conditions, and on payment of the nominal sum of 50 cents.

Interesting information is given as to the lobster fisheries. Ten years ago, it is stated, two or three lobsters were sufficient to fill a one pound can; now it takes six or seven, or more, and the opinion is strongly expressed that the fishery will not be able to stand the drain upon it much longer. In 1890 the total number of lobsters preserved in cans or sold alive amounted to 11,566,732 pounds in weight, and were valued at 1,648,344 dollars. The estimated value of the lobster factories and traps is 822,903 dollars. The Minister of Fisheries has drafted a series of regulations, which may be summarised thus:—(1) No one to fish for, catch, or preserve lobsters without a licence from the Minister; (2) No trap, boat, &c., shall be used for taking lobsters without written application, specifying the number and particulars; (3) All boats, traps, &c., to have the owner's name or mark on them, and recorded in the licence; (4) A fee of 1 cent to be levied on each trap; (5) Fixing close times at different parts of the coast (July to December); (6) Prohibiting the catching or possession of any berried or soft-shelled lobsters, or lobsters under 9 inches in length, measured from the head to the tail. An important exception is made in the case of berried females, which may be delivered at a cannery, provided the owner or manager operates, to the satisfaction of the Minister, incubators or boxes for the hatching out of the eggs removed from each female lobster received; (7) Each case of canned lobsters must bear an official label, notifying that the lobsters have been legally caught and packed; (8) All traps, boxes, or cages used for the taking of lobsters shall have the laths or slats 1¼ inches apart, so as to allow of the escape of small lobsters.

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* *Annual Report of the Department of Fisheries of the Dominion of Canada*, 1891, Ottawa, 1892.

An account is given of an attempt made to bring over living lobsters to London by a system invented by Mr M'Gray. The experiment, owing to a number of untoward circumstances, was only partially successful, but it has convinced the promoters of the practicability of the scheme; and it is stated that they 'will later on arrange for the acquisition of a 15-knot ' boat, specially fitted with the necessary apparatus, for the conveyance of ' live lobsters in large quantities across the Atlantic. This will enable ' them to supply the markets of London and Paris with first-class lobsters, ' delivered *alive* in those cities, at less than half the price now paid for ' English lobsters of equal quality.' The report contains a great deal of interesting information as to the oyster fisheries, the construction of fish-freezing and cold stores for the preservation of bait, the fisheries of British Columbia, &c.

NEWFOUNDLAND.

In their Report for 1892, the Fisheries Commission describe the work which has been done in the course of the year.*

In an interesting retrospect it is pointed out, that prior to the establishment of the Commission, in 1889, the fisheries of the colony had been almost entirely neglected, so far as any supervision or guardianship was concerned, and that they were consequently in a condition of 'alarming ' decline.' Two lines of action were decided on by the Commission:—(1) a careful investigation and study of the nature and habits of the commercial fishes, the causes which injuriously affect the fisheries, and the best modes of regulating, restoring, and protecting them; (2) the artificial propagation of food fishes, to aid in restocking exhausted grounds. Both of these have been consistently adhered to.

At the Dildo sea-fish hatchery, considerable improvements were made last year. A new spawning-pond was completed, 48 feet in length, 23 in width, and 11 feet deep, and capable of containing 96,000 gallons of water. It is supplied with sea water partly by means of an 18-feet Eclipse windmill, which is said to work most satisfactorily. Considerable difficulties and disappointments were encountered. Of the 600 spawners kept in the wells from the previous hatching season, nearly all perished from the intense cold, and a fresh collection was with difficulty procured. Much trouble was also occasioned with the boiler, which frequently gave out, and caused heavy losses of ova. Notwithstanding these drawbacks, 265,250,000 of cod eggs were collected, of which 165,250,000 were hatched successfully and planted, the yield being therefore 62¼ per cent., which was very satisfactory. During the three years the hatchery has been in operation, 222 millions of cod eggs have been hatched, and placed in the waters of Trinity Bay; and it is stated that the fishermen report having observed large shoals of young codfish in the bay during the summer and fall, such as they had never seen before the artificial propagation commenced, and which they attribute to the operation of the hatchery. Very large numbers of lobster eggs were also hatched. In 1891 the number of lobsters stripped was 28,639, which yielded 678,012,000 eggs, from which 79·8 per cent., or 541,195,000 young lobsters, were hatched. In 1892 the number of lobsters stripped was

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* *Annual Report of the Newfoundland Fisheries Commission for the Year* 1892, St John's, 1893.

20,870, yielding 484,286,000 eggs, from which 88·2 per cent., or 427,285,000 young lobsters, were hatched and planted. These figures refer to the quantities manipulated in the floating boxes or incubators. In addition, 2,500,000 were hatched at Dildo hatchery. Since the work began, the enormous number of 1,376,228,380 lobster eggs have been saved from the destruction of the lobster factories (where they are boiled and canned with the parent lobsters), hatched and set free. It is probable that the lobster takes a considerable number of years before reaching adult size, or a size sufficiently large to be retained in the lobster traps, and there is not yet, of course, any indication of the results of these experiments on the abundance of lobsters. From the wholesale destruction of the eggs, which has gone on for years at the canning factories, the lobster fisheries in Newfoundland—as indeed almost everywhere—are rapidly declining. Last season's fishery was a failure, many of the factories having to close early in June, owing to the scarcity of lobsters; and the Superintendent of Fisheries (Mr Adolph Nielsen) strongly recommends a limitation in the number of the factories, and a definition of the grounds on which their traps should be allowed to fish, and also a close-time in accordance with what has been ascertained as to the life-history of the lobster. In Newfoundland waters, the principal spawning time of the lobster is from 20th to 25th July to 20th August, the lobster being a few days later in commencing to spawn on the eastern and northern coasts than on the southern and western. The present open season—from 1st April to 20th August—is therefore too long, and should strictly terminate about the 20th or 25th July, in order to afford full protection to the spawning lobsters; but as this would unduly limit the fishing period in some places, Mr Nielsen recommends the open season to be from 1st April to 1st August on the coast between Cape Ray and Cape Race, and from 1st April to 5th August on the coast between Cape Race and Cape St John.

In an appendix, Mr Nielsen gives the results of observations made in connection with the Labrador fisheries.

NORWAY.

The seafish hatchery at Flödevig, under the direction of Captain G. M. Dannevig, was greatly improved last year by the substitution of a new pump and boiler, the former throwing about 9000 gallons of sea-water an hour. Forty-two hatching-boxes were in operation during last spring (1893), and 240,000,000 young cod were hatched and planted in the fishing-grounds along the coast. Young cod of the last two years' growth are increasing in numbers along the south coast of Norway, and it is now generally believed that this is owing mainly to the influence of the hatchery. Captain Dannevig intends to arrange for the hatching of turbot, brill, plaice, and halibut, as well as cod. The first three named are very scarce around the south coast of Norway (where beam-trawling is not practised or practicable), and are mostly imported from Denmark. The halibut fishery has greatly fallen off during the last ten or fifteen years. The law in regard to lobsters has been altered, the close time being extended. The minimum close time is now two and a half months, from the middle of July to the beginning of October, instead of one month (August). Power is still given to the County Council (*Amtsformandskaber*) to extend the close time in their districts as may be thought proper; in some cases it included seven months. No lobster is allowed to be caught under 8 inches (21 centimetres); but, as yet, the capture or sale of females bearing eggs is not interfered with. Captain Dannevig last season hatched out

95 per cent. of the lobster eggs manipulated at the hatchery; but the general results of his work in this branch of pisciculture for a number of years, leads him to believe that lobster-culture alone will not be sufficient to arrest the decline in the lobster fishery. It can only be considered as supplementary to regulations dealing with capture.

The number of young cod hatched at the Flödevigen hatchery since its establishment in 1884 is 790,500,000, the annual turn-out having increased from 7,000,000 in the year named to 240,000,000 during the present year; and the cost of production has diminished from 0·79 kröner per thousand in 1884 to about 0·03 kr. in 1892.* In the journal referred to, interesting details are given by Dannevig of his experiments of hatching lobster eggs, and rearing the young in water of different temperature and density; of experiments in cod hatching by Fr. Backer, by a mode different from that of Dannevig; of the hatching of lobsters by Dr Appellof; and of the transport of large quantities of fertilised cod eggs and larvæ in carboys from Flödevigen to Bergen. The latter experiments are of special interest in connection with hatching work, as showing how the eggs may be best transported. The newly-hatched fry, or the fertilised eggs, were placed in boxes in a sea-water enclosure, and carefully observed. The general results show that the so-called acid-carboys furnish the cheapest and best mode of transporting the ova, and that each carboy should contain only 1 litre of spawn, and, in changing the water, the dead eggs should be removed. The water should be changed every five or six hours, by means of a tube carried to the bottom of the carboy. The transport of larvæ was much less successful. The rearing experiments in the enclosure showed the importance of having a large body of water with movement in it, and of removing enemies, such as sticklebacks and young coal-fishes, which ate the spawn in large numbers. It was also proved that the young fish began to select food from the water naturally (larval crustaceans, &c.), and often before the yelk-sac was absorbed.

Recently considerable attention has been given in Norway to the insurance of fishing-boats, and the fishery inspectors, Messrs Dahl and Fleischer have published proposals for the formation of a mutual insurance association for fishing-boats in North Norway.† At present two societies exist, but they will not insure the boats for the whole course of a year, nor when engaged, as many of the large ones are in the intervals between the fishings, in carrying goods from place to place. In the association proposed, one-third of the risk would be borne by the members, and the boats would be insured for the whole year, a guarantee fund being formed with the assistance of savings' banks, corporations, and business firms.

The same journal contains several short papers dealing with the halibut, the supply of which has diminished as the demand has increased, and American fishing-smacks have gone far afield — even to Iceland and Norway for supplies for the American market. Last year fourteen vessels, of from 70 to 112 tons, from Gloucester and Boston fished for halibut at Iceland, and it is proposed in Norway to open up an industry in salted halibut for the American markets. The price of salted halibut varies from 4 cents to 10 cents per lb., and the smoked fish from 8 to 15 cents.

From the official statistical report on the fisheries of Norway, it appears that in 1891 the fisheries were prosecuted with much success.‡ The total value of the sea fisheries (oysters excluded) was 26,105,000 kroner—an increase of nearly 4,000,000 kroner over 1890, and the greatest value shown since 1880. The value of the codfish landed was 14,111,000 kr., of herrings and sprats 6,763,000 kr., of mackerel 659,000 kr., of coal-fish, ling, &c., caught in the summer fisheries 3,328,000 kr., of salmon and trout 875,000 kr., and of lobsters 369,000 kr. The value of the fish and fish products exported amounted to 48,136,600 kr., and were as follows (in kroners):—Salted cod (*klipfisk*) 18,478,500, dried cod (*tørfisk*) 5,995,000, pickled herrings 9,782,600, smoked herrings 311,700, other sea-fish pickled 1,733,200, pickled sprats 237,800, mackerel, herring, and other fish (except salmon), fresh 1,142,200, salmon (fresh) 1,386,200, lobsters 379,700. Considerable sums were also obtained for the skins of seals (559,000 kr.), walrus, and whitefish, whalebone, codfish roe (776,800), fish-guano (894,900), seal and whale blubber, and fish, seal, and whale oils (5,953,600). Some curious products are included among the exports, *e.g.*, the skins of polar bears, which brought 5700 kroner, walrus teeth, fish-bowels (22,300 kr.), whale fat and stearine (50,600 kr.), and fish glue (32,500).

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* *Selskabet for de norske Fiskeriers Fremme, Aarsberetning*, 1892, p. 5. Bergen, 1893.

† *Norsk Fiskeritidende*, 1892, p. 1(2.

‡ *Tabeller vedkommende Norges Fiskerier i aaret*, 1891, Kristiania, 1892.

At the great cod fishery of Lofoten, 30,378 fishermen and 7281 boats were employed, the produce consisting of 21,050,000 codfish, 57,662 hectolitres of liver, and 19,635 hectolitres of roe, the total value amounting to 6,673,000 kr. In the next great fishery—that of the Finmark capelin cod fishery—15,596 fishermen and 4123 boats were engaged, the produce being valued at 2,828,000 kr., and consisting of 13,503,000 codfish, 36,574 hectolitres of liver, and 158 hectolitres of roe. The great cod fisheries produced altogether 49,612,000 codfish (against 63,303,000 in 1890), valued at 14,111,000 kr. In the summer herring fisheries 7945 boats, manned by 30,180 men, were employed, 852 using seine or sweep nets, and 7093 the ordinary drift-net; 867 boats with drift-nets (*drivgarn*) and 3294 men were engaged in mackerel fishing, the total catch being 5,381,000 mackerel. The figures referring to the numbers of lobsters caught are of interest, since they show a gradual falling off since 1886, when 1,134,000 were caught, until last year, when the catch was only 583,000, the lowest recorded.

SWEDEN.

The Bohuslän Fishery Journal contains a number of interesting papers.* In Sweden, as in Norway, Denmark, and other countries, attention is being paid to the formation of systems of fishery insurance, with or without the support of the Government. Proposals are also being made for the establishment of a Fishery Board on the model of the Dutch and Scottish Boards, for the sea fisheries on the west coast of Sweden, and for the regulation of the herring fishery. Dr A. H. Malm, inspector of fisheries, has drawn up a proposed Act of Parliament on this subject dealing with such points as the loss of tackle, the throwing out of ballast or dead fish on the fishing-grounds, the use of the *vad* and *garn*, so as not to interfere with one another, &c. One section proposes that on Saturday evenings, and on the evenings before any holiday, all tackle, except *strangvad*, should be taken out of the sea; that no tackle be set on Sundays or holidays; that no set-nets (*sättgarn*) be set or lifted between sunset and sunrise, &c.

There is also a full account of the legislation regarding the lobster fishery. The law of 1833 and 1837 enacts a close-time between 1st July and 15th September, and this was confirmed in 1852. A statute of 1890 prohibits lobster fishing in the latter half of September; and this is stated to be unsuitable for the west coast.

In an interesting paper on the curing of herrings in Bohuslän it is stated that the curers are adopting more and more a good and rational system of cure, 'due, without doubt, in great part to the introduction of Scotch 'coopers.' In the report of the inspector for 1891–92, it is stated that all the spent fish ('*tomsill*') were treated according to the Scottish method, while most of the full herrings ('*fullsill*'), which are nearly all consumed in Sweden, were treated in the Norwegian mode. The old curing-yards, founded on the model of the *packbodarne*, in Bergen and other Norwegian towns, and which are described as dark and dirty, are giving way to the Scotch style, which began to be introduced about ten years ago. It appears also that some of the Swedish curers are imitating the Scotch brands, and it is recommended that a similar system should be introduced into Sweden, for Swedish-cured herrings, as follows :—

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* *Bohuslänsk Fiskeritidskrift, utgifven af Axel Vilh. Ljungman,* 1892.

For Fulls—

'F.,' when total length = 32 centimetres.
F.A., ,, ,, ,, = 32 to 29 ,,
F.B., ,, ,, ,, = 29 ,, 26 ,,
F.C., ,, ,, ,, = 26 ,, 23 ,,
M., ,, ,, ,, = 23 ,, 20 ,,

Spents to be similarly distinguished, 'S.,' replacing the 'F.' on the brand.

Dr Rudolf Lundberg in another publication * gives an account of the investigations made in the inland waters of Sweden, and publishes the address of Professor Otto Pettersson on 'The Hydrography of the North 'Sea,' delivered before the meeting of Scandinavian naturalists at Copenhagen last year. The latter is a very important contribution, but is too long to even summarise here. Professor Pettersson describes in great detail the movements of the waters in the Baltic, and between the Baltic and the North Sea, and shows how they appear to be related to the Bohuslän herring fishing and to the mackerel fishing.

DENMARK.

The Official Report for 1891–92 contains a number of additional bye-laws under the fishery law referred to in previous reports. These deal with hook fishing, tackle, the setting of nets and marks, close times, closed grounds, under-sized fish, &c.†

The statistics deal with the Danish fisheries in different groups. Those referring to the west and north-west coasts of Jutland (exclusive of deep-sea fishing in the North Sea), show that from 1st March to 31st December 1891 the total value of the fish landed in this district was 595,633 kröners, or over £30,000 (haddocks, cod, plaice, and lobsters bringing in the largest amounts), and to this may be added about 100,000 kr. as the earnings of two steam-trawlers. The Danish fishing fleet in the North Sea in 1891 numbered 521 boats and vessels, with a total net tonnage of 5219, the tonnage varying from 68·66 to 0·99. The fisheries inside the Skaw (exclusive of those of Limfjord) yielded in 1891 fish valued at 3,795,349 kr., as against 3·728,110 kr. in 1890, or an increase of 67,000 kr. The value of plaice and flounders was 1,111,486 kr., a decrease of 64,000 kr. from 1890 ; of soles, 180,006 kr., a decrease of 21,688 kr. ; of turbot, 12,324 kr., a decrease of 1061 kr. Herrings were valued at 811,387 kr. (those caught by set-nets bringing 301,144 kr. ; those by drift-nets 510,243 kr. ; cod and haddock were valued at

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* *Svensk Fiskeritidskrift.*

† *Fiskeri-Beretning for finantsaaret,* 1891–92, C. F. Drechsel.

428,984 kr.; mackerel at 21,607 kr.; eels at 281,305 kr.; and shrimps at 126,671 kr. The number of men employed was 7,734, compared with 7615 in 1890. The fisheries in the Limfjord employed 1142 vessels, valued at 141,262 kr., and the total value of the fish landed was 945,190 kr.—chiefly eels (441,090 kr.); flounders (228,075 kr.); and cod (158,220 kr.).

The fisheries in the North Sea and Skagerack have recently undergone considerable improvement, the cutters employed being larger and furnished with steam-power for raising the seine ("*vaad*"). Complaints are made that since the general introduction of steam-power in trawling, foreign trawlers go nearer the Danish coast, and frequently damage the lines of the line fishermen. The government granted a sum of 25,000 kr. for experiments in sea fishery at Iceland and in the North Sea, and the "Prinsesse Marie," a vessel of 72 tons, was selected for the purpose, and other four cutters were associated with it; and the government also advanced 50,000 kr. for insurance of vessels at Iceland and the Faröes, to cover risks which the ordinary insurance societies do not undertake. A zoologist accompanied the "Prinsesse Marie" to investigate the conditions of the fishing-grounds, &c. The cutter made four voyages to the North Sea, and as one result it is stated that cod cured as "Laberdan" (Haberdine or Aberdeen), prepared according to the Dutch method, will have a good sale in the country. It brought from 35 to 45 kr. per barrel of about 260 pounds of fish. At the Faröes various experiments were made. Lobster fishing was tried, but not a single lobster was got. Particulars are given as to the plaice fishing at Iceland. There is also a report to the minister of a visit of inspection to Norway, and interesting details are given of the fish-preserving establishments at Stavanger, and of the process of freezing bait (capelan) along the Lofoten and Finmark coasts.

Owing to the gradual decrease in the quantity of plaice in the Limfjord, experiments have been made by transferring large numbers of small plaice from another part of the coast, where the young fish come in in large numbers from the sea, to the inner reaches of the Limfjord. In this way over 63,000 young plaice have been planted at a cost of 1987 kr.

Dr C. G. Joh. Petersen, the Director of the Marine Biological Station, has published a very interesting paper "On the Eggs and Breeding of the Gobiidæ." The gobies exist in very large numbers in Danish waters, and Dr Petersen has investigated and described the eggs of all the common species, *G. niger*, *G. Ruthensparri*, *G. minutus*, and *G. microps*. The paper, which is also given in English, is accompanied by two plates.

HOLLAND.

The scientific fishery investigations referred to in last year's Report have been continued by Dr P. P. C. Hoek, the adviser on fisheries to the Government. His researches on the habits and propagation of the Rhine salmon are, I believe, in an advanced state, and the results will probably be published early next year. Another very extensive investigation concerning the generative organs and genital ducts of teleosteans is also far advanced, and, coming from so eminent a zoologist, will no doubt greatly increase our knowledge on this important branch of fishery investigation. Dr Hoek, owing apparently to the recent labours of Dr Ehrenbaum on the subject, has made a renewed study of the anchovy—an important little fish in Dutch waters. Floating eggs of the anchovy have been discovered in large numbers within the Zuiderzee; and Professor Hoffmann of Leiden is also working at the subject. The investigations on the question of immature fish have been unfortunately interrupted by the want of a proper seaworthy steamer—undoubtedly the most important instrument for scientific fishery research. The Government are now considering whether one something like a Grimsby steam-trawler should not be built for the purpose.

An inquiry was made by Dr Hoek in 1891 and 1892 as to the inland or fresh water fisheries of one of the provinces (Zuid-Holland).* Dr Hoek in his report describes the fisheries and their regulation, and the chief fishes caught (perch, pike, &c.), and makes various proposals as regards close times, mesh of nets, &c. The general conclusion is, that all the regulations of the inland-water fisheries, with the exception of the salmon fishery (which is regulated by a special royal edict as well as by international treaty), are a failure, and that, as a consequence, no one cares to spend money on the artificial propagation and cultivation of the fresh-water food fishes.

I am indebted to Dr Hoek for a copy of an exceedingly interesting and detailed report on the habits, life-history, and ravages of the isopod *Limnoria lignorum*, so destructive to timber.† The report deals with the history, geographical distribution, anatomy, biology, &c., of the crustacean, and the means of combating its ravages, and it is illustrated by a number of plates.

At the meeting of the Fourth Dutch Congress of Naturalists, held at Groningen in April of this year,‡ Dr Hoek delivered an address on scientific fishery investigations, especially in relation to their utility as a means of developing the fisheries. He described the activity which has been shown in such investigations in various countries, such as America, Germany, England, Holland, and Scotland. In regard to the investigations of the Scottish Fishery Board, Dr Hoek says that Scotland has probably been the most fortunate in this respect, and that the investigations have been repeatedly shown to be of great practical value. He refers especially to the various North Sea fisheries, and to the great increase which has taken place in the means of capture during the last thirty or forty years, and, as a consequence, that the sea seems no longer able to fulfil the demands made upon it—'We appear to take fewer fish, and those of a smaller size.' He says, if you ask a Dutch fisherman why fish are scarce, he will blame the English steam-trawlers, while the English fisherman blames the Dutch, Belgians, and Germans for fishing in the shallow waters near the coast, and capturing immense quantities of small fish. But Dr Hoek points out that it would be dangerous to make regulations until we can judge exactly of the nature and extent of the injury; he insists on more complete knowledge of the life-history and habits of the food fishes, and refers to many questions of importance about which we are still ignorant, and describes the results of the trawling experiments on the Scottish coast.

The official report on the Dutch fisheries for 1891§ contains, as usual, a very large amount of information regarding the sea fisheries of Holland. The Dutch herring fishery is divided into three kinds—(1) the 'great' sea fishery (*zout haring visscherij*), the produce of which is the well-known pickled herrings (*pekelharing*) salted on board; (2) the 'small' sea fishery, or coast fishery, which produces the *Steurharing* for smoking. In 1891 the number of vessels employed in the herring fishing was 206 luggers and sloops, each manned by 14 or 15 men, and 279 boats (*bomschuiten*) manned by from 8 to 10 men; making a total of 485 vessels and boats, and about 5600 men. It is interesting to note the progress which the Dutch herring fishery has made in recent years. In 1859 the number of vessels (*loggers en sloepen*) prosecuting the great fishery was 79, which caught and cured 1656 lasts, valued at 564,500 florins; the number of boats prosecuting the small or coast fishing for fresh herrings was, in the same year, 178, the catch of herrings being 27,768,700, valued at about 444,288 florins. Since then the number of boats and vessels have increased year by year, and those engaged in the 'great' fishery off the British coasts have been greatly improved in build, and are much swifter than the old style of vessel. Thus in 1867 there were 85 of the old Dutch hoekers and sloops and 4 luggers and cutters; in 1891 the number of the former was only 7, and of the latter 199. The number of herring-vessels and boats in 1891 was 23 more than in 1890, and 46 more than in 1889. These facts, which contrast with the conditions in Scotland during recent years, indicate with what success the Dutch are striving to regain their ancient position as the purveyors of pickled herrings to the Continent. Steamers were employed as 'jagers,' or carrying boats, to bring the early cured fish rapidly to market; the first arrived at Vlaardingen on 22nd June with 101 barrels of fulls and $307\frac{3}{4}$ matties, collected from 94 vessels, and the price obtained was from 79 to 189 florins for fulls, and from 17 to 67 florins for matties. These facts should be kept in view in considering questions of close times for herring on the east coast of Scotland. The total catch was 349,781 barrels, or 74,000 less than in 1890. As 14 barrels go to the last, it will be seen (*supra*) that in 1859 the catch was only 23,184 barrels.

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* 'De Binnen- of Zoetwatervisscherij in Zuid-Holland,' *Rapport aan Gedeputeerde Staten van Zuid-Holland.*

† 'Rapport der Commissie uit de k. Ak. van Wetenschappen, betreffende de Levenswijze en de Werking van *Limnoria lignorum.*'

‡ *Wetenschappelijk Onderzoek in dienst van de Visscherij.*

§ *Verslag van den Staat der Nederlandsche Zeevisscherijen over* 1891.

Of the 13,362 lasts cured last year, 10,687 were fulls, 407 matties, 1115 spawning fish (*kuit- en homzieke*), and 828 spents. The total value of the herrings caught in 1891 was as follows:—

Great Herring Fishery in North Sea—	
Brought by 'Jagers,'	33,000 florins.
Pickled and 'roused' herrings brought by sloops and luggers, . . .	2,949,000 „
Coast Fishery, with 'bomschuiten,' both pickled and 'roused'—	
Scheveningen, ...	2,300,000 „
Katwijk, ...	631,000 „
Noordwijk, ...	116,800 „
	6,030,000 florins.

This is equal to £502,500. In 1886, the value was 4,017,900 florins; in 1887, 3,769,840 florins; in 1890, 5,909,495 florins. The exports of herrings in 1891 amounted to 32,754,000 kilogrammes, or 218,360 barrels, of which 177,373 barrels went to Germany, 21,920 to Belgium, 10,547 to America, and to 'all other places,' 8520. The export of smoked herrings (*bokking*) was 36,459,000, Belgium taking 18,666,000, and Germany, 17,793,000. The import of herrings was only 710 barrels.

In the large and trawl-net fishery a considerable number of vessels were employed. From Vlaardingen, 39 vessels took part in the 'beugvaart' fishery, making 116 journeys, and bringing in 5655 barrels of salted fish and 524 barrels of salted ling. The trawl-fishing was prosecuted by Scheveningen luggers. The statistics relating to the large and trawl-net fishings from 1st November 1890 to 12th July 1891, show that 119 boats were engaged, making 527 journeys, and bringing back the following quantities of living fish:—Cod and ling, 41,932; haddocks, 439,585; halibut, 174; rays, 2607; thornbacks (? *vleet*), 502; and 6009 barrels of salted cod, 413 barrels of salted ling, 967 barrels of salted haddock, and 128½ barrels of plaice. The total value was :—Fresh fish, 219,749 florins; salted fish, 317,197 florins = 536,946 florins. Salted cod and dried cod are exported in large quantities to Belgium, Germany, and France.

The coast trawl-fishing in the North Sea—at Scheveningen, Katwijk, and Noordwijk—was prosecuted by 225 boats, and the value of the produce at the three places named was 283,363 florins. The total consumption of salt for the sea fisheries in South and North Holland was 19,235,239 kilogrammes. The total export of fresh fish (chiefly to Belgium) was 4,312,000 kilogrammes; the export of shrimps amounted to 1,442,000 kilogrammes, of which 1,284,000 kilogrammes were sent to England, and 154,000 to Belgium. The shrimp-fishing in the Schelde and Zeeuwsche river was so successful that the fishermen were able to earn as much as 45 florins per week. The exports of shell-fish in 1891 from Zeeland were as follows :—Oysters, 1,348,891 kilogrammes, or 17,985,212 oysters, valued at 1,348,891 florins, of which 338,357 kilogrammes came to England; mussels, 1,580,283 kilogrammes, or 18,591 hectolitres, valued at 278,865 florins. The industry of sardine-curing has been started in Holland by the erection of a factory at Nieuw-Helvoet.

In an Appendix is a valuable report, by Dr P. P. C. Hoek, on the anchovy and the anchovy fishery on the Zuiderzee.

In the special report on the fisheries in the Schelde and Zeeuwsche rivers* will be found an amount of interesting information concerning the fisheries of the region. On the West Schelde alone, the take of shrimps amounted to 1,200,000 kilogrammes, and it is stated that England is the chief market for the shrimps taken by Dutch fishermen.

At the Sixth Annual Conference of the Association for the Promotion of Dutch Fisheries, held at Amsterdam last year, a number of fishery questions were discussed,† but mostly of local interest, such as the formation of harbours, placing of buoys, removal of wreckage, close times for mussel-beds, &c. It was agreed to petition the Government to fix a minimum mesh of 18 millimetres for the 'kuil' nets and 'fuiken' used in the Zuiderzee, and the question of the capture and destruction of immature fish in the North Sea was also discussed.

JAPAN.

In a previous report I referred to the importance of the Japanese fisheries, and to the supervision which was exercised by the Government. A proof of the thoroughness with which the Japanese authorities attend to their fisheries is afforded by the publication of an extensive report in four volumes, and ten parts descriptive of them,‡ a copy of which has been courteously forwarded by M. de Bunsen, H.M. Chargé d'affaires. Each part deals with the fisheries of a particular area or region, and is copiously illustrated by plates representing the chief varieties of fish and shell-fish, the fishing apparatus, &c., and also contains a chart of the fishing grounds. Unfortunately for my present purpose, the text is in the Japanese character; but I hope to have it examined by an expert before our next Annual Report appears.

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* *Verslag omtrent den Toestand der Visscherijen in de Schelde en Zeeuwsche Stroomen in* 1891.

† *Verslag van de Zesde Jaarlijksche Algemeene Vergadering van de Vereeniging ter bevordering van de Nederlandsche Visscherij.*

‡ *Preliminary Report upon the Fisheries of Japan.* Agricultural Bureau, Department of Agriculture and Commerce, Imperial Japanese Government, 1891-1893.

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